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Intelligence of Elementary Level Children of Differing Socio-Economic Status as Measured by the Davis-Eells Games and the Stanford-Binet

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INTELLIGENCE OF ELEMENTARY LEVEL CHILDREN OF DIFFERING SOCIO-ECONOMIC STATUS AS MEASURED BY THE DAVIS-EELLS GAMES AND THE STANFORD-BINET

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CHAPTER I

INTRODUCTION

Statement of the Problem

The problem in this study was to determine whether the Davis-Eells Test of General Intelligence or Problem Solving Ability yields scores comparable to those obtained on the Stanford-Binet, form L.

Need for the Study

It is well known that children of differing cultural backgrounds do not perform equally well on currently used mental ability tests. Allison Davis, Kenneth Eells, and others at the University of Chicago have for some years been working on the construction of a test of mental ability which would minimize the importance of differences in cultural backgrounds. In 1953 the culmination of their efforts, the Davis-Eells Test of General Intelligence or Problem Solving Ability, was published by the World Book Company.

This test is designed for use with children in grades one through six. The authors of the test claim that part of the usual test superiority attributed to children of high status has been due to the presence in many test items of content which higher status children would have had more opportunity for learning. They feel that the items on their new test consist of problems of a kind found in most of the basic areas of children's lives including their school, home, stories, and work.

The manual for the Davis-Eells Test lists comparisons

between several group mental tests and the Davis-Eells for grades three through six. No comparison betwen Davis-Eells Test scores and individual mental test scores is listed. The usefulness of the Davis-Eells Games[1] is of course dependent upon whether an adequate measure of general mental ability can be obtained on this test for children of limited background. Usually individual tests, such as the Stanford-Binet, are administered when it is felt that the usual group tests are not giving a true picture of the ability of underprivileged children. If the Davis-Eells yields scores comparable to those obtained on the Binet with the low socio-economic status children this writer feels that its usefulness is assured.

Previous Research

The influence of social factors on the estimation of a child's intelligence is a question which has not been fully answered by the research in the mental testing area. Present day intelligence tests have been characterized as "culturally biased" and attempts have been made to produce "culture-free" tests. Allison Davis (10) studied eight present tests and found that not one test included any problem on which the lower socio-economic group came out superior to the higher socio-economic groups. The standards used for selecting items in present tests have resulted in discrimination among socio-economic groups. One of the problems which has attracted much attention is that of the inherent intellectual superiority of whites

1. The pupil's booklet for the Davis-Eells Test is entitled "Davis-Eells Games." Hereafter in this report the Test will be referred to by this name.

over Negroes. Herman G. Canady (7) has pointed out that comparisons between whites and Negroes have been made in at least two ways. One, the percentage of overlapping and two, intelligence quotient. The test standing of Negroes has suffered in comparison with whites because of their poorer social environment which consists of such factors as socio-economic level of the home, schooling, and community influences. In trying to equate the two "racial" groups, some of the existing problems are: fundamental difference in attitudes toward the material aspects of environment, differing hierachy of occupation in the two groups, unequal opportunities for employment in higher positions.

H. A. Transer (18) investigated the problem of the intelligence of Negroes, and fifty-five Mixed-bloods. Of these fifty-five, twenty-seven were three-fourths Mixed-bloods, seventeen were one-half Mixed-bloods, and eleven were one-fourth Mixed-bloods. The tests used in this study were the National, the Pintner Non-language, and the Pintner-Paterson Performance Test (Short Scale). According to the writer on all three tests the Mixed-bloods surpass the full bloods, and the quarter bloods surpass all other Negro groups, thus indicating a trend towards positive correlation between intelligence and degree of white blood.

The problem of Kenneth L. Bean's (1) investigation was to measure the efficiency of a group of Negroes in grasping relationships, arrangement of ideas or objects, and classification

with language and non-language test material. No two tests were found which would fit the situation perfectly as whole tests, but two were located which would afford a fair comparison. These two tests were the Otis Self-administering Intermediate Examination, Form A., and the Minnesota Paper Form Board. The Otis test consists entirely of verbal material. The subjects for this experiment were forty-nine eight grade pupils from a colored school in Baton Rouge, La. There were twelve boys and thirty-seven girls. These subjects were selected at random and were slightly below the average group of students for that school. An IQ range of 50 to 110 was obtained on the Otis, with percentiles from 0 to 80. The mean percentile for the Minnesota Paper Form Board was 23.2, with a range of 0 to 100. According to the writer when the critical ratio technique was applied to these two averages, the difference stood 99.74 chances in 100 of being greater than zero. The correlation between these two measures was found to be .23, which is not reliable. This study has shown that the group of Negroes tested is distinctly inferior to whites of the same age in thinking ability with verbal and non-verbal problems involving classification, arrangement, and relationships.

H. G. Canady (6) conducted a study to discover whether there were significant differences in intelligence scores within Negro society depending upon variation in several factors or conditions that appear to have relevance to mental development. The study included 497 cases, comprising the entering students at West

Virginia State College. The data relative to the students' background and mental ability were secured from the following sources: 1) student's application blanks?) Sims Score Card for socio-economic status, and 3) scores on the American Council Psychological Examination. The mean score for Group I, the low socio-economic groups, was 80.60, the mean for Group II, the middle socio-economic groups, was 94.03 and the mean for the high socio-economic group, Group III was 98.90. The difference between the means of Group I and III is significant with a critical ratio of 3.73. The difference of means for Group I and II is also significant with a critical ratio of 3.22. The difference for Group III and II was not found to indicate a significant difference in intelligence test standing according to the writer. Negroes differ among themselves as individuals considerably more than they differ from whites as a group. The Negro youth of the higher social level achieves, on the average, higher intelligence scores than do those of lower social levels when these levels are determined by the Sims Scale or expressed as occupations of the father, education attainments of parents, and communities in which they live. The evidence presented in the study leads to the conclusion that reported Negro-white differences in intelligence test performance are due to all probability to the Negro's position in the American social system.

Studies have been made on the intelligence of Indian children. In 1929, Robert J. Havighurst and others (14) tested the hypothesis that the Draw-A-Man Test is a valid test of one aspect of general intelligence, namely, the formation of

concepts based upon observation, with the aid of information about the various cultures in which the Indian children grow up. Indian children take an active interest in the world of nature and are given much opportunity to form and express concepts of natural objects on the basis of their own observation. The Goodenough Draw-A-Man test was given to 325 Indian children of Sioux, Hopi, Zuni, Zia, Navaho, and Papago tribes in nine communities, in the age group six through eleven. The subjects were selected so as to represent their communities, and the sampling procedure appears to have been satisfactory in at least five of the nine communities. The results show the Indian children to be superior to white children. Average IQs range from 117 (Hopi, first Mesa) to 102 (Sioux, Pine Ridge.) Boys do significantly better than girls in the Hopi, Zunia, Zia and Sioux Groups. The conclusions from this study were: 1) Indian children from the tribes tested do better than white children on the Draw-A-Man Test. 2) Indian boys from Pueblo groups do better than girls on the test, and 3) the evidence points strongly to the conclusion that environment affects the performance of children on the Draw-A-Man Test.

Garth and Smith (13) conducted a study to obtain a measure of the performances of full-blood Indians on a non-language intelligence test, with a comparison of their performances on a language, or verbal, intelligence test. The tests used were the Pintner-Non-Language Mental Test and the Otis Classification Test. The Indian children tested show a performance on the Pintner test

more nearly equal to white children's performance than they do on the verbal test. Intelligence scores for the Pintner tests, while inferior to that of white performance, were from ten to fourteen points higher than IQs for the verbal test. The study indicated that verbal tests may be unfair to Indian children if it is granted that the non-language tests measure intelligence.

Levesay's (16) study considered differences in intelligence, race and sex, according to three groups of income level, of 1,383 high school seniors in Hawaii. The IQ scores were derived from the American Council Psychological Examination. The sampling included Asiatic, Hawaiian, Caucasian, Caucasian-Hawaiian, Chinese, Filipino, Japanese, Koran, Portuguese, two Puerto Ricans, and one Spanish. The economic condition was determined from the approximate yearly income of the father. The incomes were classified into three categories: low (less than $1,500), middle (from $1,500 to $4,999), and high ($5,000 or above). The high group had a critical ratio of 7.51, the middle group's critical ratio was 13.71, and for the low group the critical ratio was 9.09. The differences of the means for all three groups are significant. Higher incomes seem to be predictive of higher "intelligence" test scores. A wide range of scores was evident in all distributions, with appreciable proportions of good and poor talent in each group.

Cook and Arthur (9) investigated the problem of whether a significant difference would be found between the verbal (Binet) and nonverbal (Form I of the Point Scale of Performance Test) ratings. The sampling consisted of ninety-seven Mexican children

The range of chronological age was from six years and seven months to sixteen years and six months, with a median chronological age of twelve years and seven months. Both tests were given in immediate succession. For this group of Mexican children the Median mental age on Form I of the Point Scale of Performance Tests was eleven years and ten months. The mean IQ was 101.06, with a standard deviation of 17.35. The median mental age on the Binet scale was nine years and six months. The mean IQ was 83.77, with a standard deviation of 14.14. For a group of this size, a difference as great as this between verbal and nonverbal ratings was found to be significant according to these writers. Judging from the results of this study it would seem that educational and vocational guidance for Mexican children should be based upon results from nonverbal intelligence scales as well as the more commonly used verbal scales.

Carlson (3) attempted to ascertain whether any alleged group differences in intelligence between white children of non-Mexican parentage remain when research conditions are controlled as much as possible. A control group of white children, both parents of each child having been born in countries rather than Mexico were compared in intelligence over a period of five-and-a-half years with an experimental group of children, each of whose parents were born in Mexico. Variables that have been significant in other studies were controlled. All the children used as subjects in this experiment lived in the city of Los Angeles. To control the general socio-economic level and the total cultural

complex, only those children who lived in a fairly homogeneous, restricted, and old section of Los Angeles were included in this study. In the experimental group (Mexican-American) there were 115 subjects. The control group had 105 subjects. The mean chronological age for both groups in months was 79.1 for the experimental group and 75.9 for the control group. The tests used were: Detroit Beginning First Grade, Kuhlmann-Anderson, California Test of Mental Maturity and a few Binets. There were tested three times. The mean on the first testing for the experimental group was 94.1, for the control group 105.0; the second testing resulted in a mean of 91.0 for the experimental group, and 99.6 for the control group; on the third testing the mean was 88.5 for the experimental group and 103.3 for the control group. The sub-experimental group consisted of fifty-two subjects and the sub-control group consisted of sixty-five subjects which were taken from the original groups. The mean IQ on the Detroit First Grade was 97.00 for the experimental group, 107.73 for the control group; second testing on the Detroit Primary for the experimental group was 91.44 and 105.55 for the control group. The correlation coefficient between the first and second testing periods for the sub-experimental group the coefficient was .79; while for the sub-control group it was .60; between the first and third testing periods for both sub groups it was .48. The American children of Mexican parentage were found to have consistently lower mean IQ scores than the American children of white non-Mexican parentage.

Brown (5) compared 323 second generation Scandinavian and 324 second generation Jewish kindergarten children in the Minneapolis Public Schools on the 1916 Revision of the Stanford-Binet. This group was classified according to the Goodenough-Anderson scale of occupations into six socio-economic levels. A critical ratio of 0.13 was found for a comparison of the means between the two groups. Neither group exceeded the other in general vocabulary scores, basal age or chronological age. No differences in general mental level were present when socio-economic status was controlled and matched in terms of the occupational distribution found in the community from which the sample was taken.

Brille (3) summarized English and American studies up to 1930 on Jewish and non-Jewish intelligence and came to the following conclusions: 1) Jewish children in Great Britian and the United States were found to be superior or at least equal in intelligence to non-Jewish children of similiar socio-economic status. 2) Jewish children were found, in most cases, to be superior to the children of ther foreign born racial or national groups, notable of Italian and Central Europeon stocks. 3) Distribution of intelligence was found to be more homogeneous for Jewish and non-Jewish children in non-verbal intelligence, there are not sufficient data to warrant conclusions.

Wheeler (20) in 1930 made a study of the intelligence of East Tennessee Mountain children. The Dearborn and Illinois

Intelligence Tests were given to 1,146 children in grades one through eight in twenty-one mountain schools. The median IQ on the Dearborn test was 82 and on the Illinois test it was 78. The conclusion was that both test scores were affected by environment. After ten years, this same area was tested using the same tests. A larger sample was used. Changes had been made in the community, including roads giving every community access to progressive areas outside of the mountains. Larger schools with better facilities were constructed and teachers were required to have four years of college. Farming methods changed materially. In 1940, the test results of this area had shown a difference of eleven points higher than the group of 1930.

Britton (4) investigated the problem of discovering the effect of socail class membership upon performance on certain standardized group tests of intelligence and upon performance on the Draw-A-Man Test. The subjects included 102 boys and 132 girls whose social status was determined by using Warner's Index of Status Characteristics. Standardized verbal and nonverbal group tests of intelligence (Henmon-Nelson, Otis Alpha Verbal, Otis Alpha Non-verbal, and Kuhlmann-Anderson) were administered to these subjects. The results of this study show that on the Henmon-Nelson, Otis Alpha Verbal, Otis Alpha Non-verbal, and Kuhlmann-Anderson, the high socio-economic group obtained a mean under 100. One year later the Goodenough Draw-A-Man Test was administered to the same subjects, and according to the writer, a significant difference

between performance of low status groups and higher status groups on the Draw-A-Man Test was not revealed. On the basis of the data used, the Draw-A-Man Test was not affected to any significant extent by the social class as were the other tests used.

Jourdan (15) conducted a study to discover the influence of parental occupation on the scores of children. The subjects tested on the Pintner-Cunningham Primary Mental Tests, Dearborn Group Tests and the National Intelligence Tests, were 1200 school children in grades one through seven. Subjects were classified according to the economic level of their parents using Taussig's classification. Substantial differences in median scores appeared among the various occupations. The children of the professional group scored 105, while those of mill workers and farmers scored 91 and 88 respectively. The children of traveling salesmen, insurance agents, merchants, bankers, lumbermen, plumbers, and machinists scored in the neighborhood of 100, while those of carpenters, clerks, stone cutters, blacksmiths, and laborers scored in the neighborhood of 90. In the occupations represented largely by semi-skilled workers the poverty of the environment is so severe that children's scores on IQ tests are definitely lowered so that children who begin their work in school with normal capacities have dropped to the level of dullards by the time they have attained the age of 13 according to the writer.

The studies reviewed show definitely a difference between measured

intelligence ratings of high and low socio-economic groups. Some studies indicate a rise in mean IQs for the low status groups when performance tests are substituted for either group or individual verbal tests. These performance tests were mostly individually administered.

Definitions

Intelligence

For the purpose of this study the definition of intelligence given by Walter Van Dyke Bingham will apply. (2) Intelligence is the ability to solve new problems. This ability, while largely determined by heredity and maturation, varies also with the individual's condition. It is subject to substantial improvement through exercise and favorable environmental influences. It is not a single uniform ability, but is highly complex. It varies in the individual with the type of problem to which it is applied.

Socio-economic Status

Socio-economic status implies social and cultural differences among groups resulting at least in part from differences in economic status. Socio-economic status is difficult to measure in that it is a complex group of traits or characteristics, each of which is in turn difficult to measure accurately. Socio-economic questionnaires have been devised but their validity and reliability has for the most part been low. In the present study it was decided that the most effective measure of socio-economic status would be the economic

classification of the father of each child according to categories set up by Davis and Eells in their standardization of the Davis-Eells Games. In the high socio-economic group are the professional people, including doctors, lawyers, dentists, teachers, architects, and large business owners. In the middle socio-economic group are the white-collar office workers, salesmen, and skilled workers. In the low socio-economic group are the unskilled laborers.

CHAPTER II

METHOD OF PROCEDURE

Sampling

Permission was secured from the Omaha Public Schools to carry out this study. In order to disturb as few classes as possible the Omaha Public School officials requested that the sample be taken from the fifth grades of Minne Lusa and Kellom Schools. Sixty-two pupils were selected from Minne Lusa and Kellom Schools. Of these, sixteen were from the high socio-economic group, twenty-one were from the middle socio-economic group, and twenty-five were from the low socio-economic group. Of the thirty-five pupils from Minne Lusa, twenty-three were female caucasians and twelve were male caucasians. Of the twenty-seven pupils from Kellom, five were female caucasians, eleven were female Negroes, seven were male caucasians, three were male Negroes, and one was a male Chinese.

Determination of Socio-economic Status

Socio-economic status in this study was determined by the occupation of the employed parent or parents. This information was obtained from the pupil's school registration card.

Description of the Tests

Two tests were used in this study, the Revised Stanford-Binet and the Davis-Eells Games.

Stanford-Binet

In 1908, Alfred Binet after more than fifteen years of

patient research developed the system of mental tests now known as the Binet-Simon Intelligence Scale. Two revisions of the test have been made. The first revision was in 1916 and the second revision was in 1937. This second revision was under the direction of Lewis Terman and Maude Merrill of Stanford University and the test bears the name of the school. The Binet scale was made up of an extended series of tests in the nature of problems, success in which demands the exercise of the intellectual processes. As left by Binet, the scale consisted of 54 tests, ranging in difficulty from tests which are difficult enough for the average adult. The first revision consisted of 90 tests, and the second revision in 1937 consists of 129 tests. The 1937 revision has tests below the five year level located at half-year intervals, and the scale has been given two supplementary superior adult levels. The purpose of the test is to measure general intelligence, not special abilities in a particular line. The tests included are: memory, language, comprehension, size of vocabulary, orientation in time and space, eye-hand coordination, knowledge about familiar things, judgment, ability to find likenesses and differences between common objects, arithmetical reasoning, resourcefulness and ingenuity in difficult practical situations, ability to detect absurdities, apperception, the speed and richness of association of ideas, the power to combine the dissected parts of a form board or a group of ideas into a

unitary whole, the capacity to generalize from particulars, and the ability to deduce a rule from connected facts. The test is a mental age scale with six tests each at most age levels, so placed because over fifty per cent of children of that chronological age could pass the test satisfacterily. The child's total mental age represents the level at which he equals the average individual in mental maturity. This mental age divided by his chronological age and multiplied by 100 yields the index we call the intelligence quotient or IQ.

Davis-Eells Games

The Davis-Eells Games is a series of problems designed to measure as accurately as possible the ability to solve problems of a kind interesting and important to children. This "ability" may be thought of as the sum total of the skills of thinking, work habits, and other factors which determine how well any given individual will be able to solve important kinds of intellectual problems that face him in life. This test has two forms, one designed for use with primary children and the other for use with elementary children in grades three through six. With all test items consisting of pictures and accompanying verbal material read by the administrator, the test eliminates reading by the pupil. The test consists of "probability" problems, "money" problem, "best-way" problems, and "analogies" problems. These problems are of a kind found in most of the basic areas of children's lives. The method of administering this test is such

it is almost totally a power test. Since the items are read one at a time to the pupils, all must proceed at the same rate and there is no advantage given to fast workers. The test consists of sixty-two problems, given in two periods. Problems 1-28 are given in the first period and 29-62 in the second period. The total time needed for administration of the test is approximately 50-60 minutes per period.

Testing Procedure

In order to establish rapport with the pupils they were asked their date of birth, names of their parents, occupation of their parents, their address, and number of brothers and sisters in the family.

The pupils in Minne Lusa School were the first to be tested. The Revised Stanford-Binet test was administered first. The nurse's office was used as a testing room in which to administer the test to each pupil. The pupils were tested at one time on the Davis-Eells Games, a total of thirty-two pupils being in this group. The teacher and the practice teacher acted as proctors. The three pupils absent were tested at another time. The Davis-Eells Games took two periods, with a break between them.

The Revised Stanford-Binet was the first test administered at Kellom. School. For the Davis-Eells testing, the pupils were divided into two groups. The boys, a total of 11, were tested as a group; the girls, a total of 16, were tested as a group.

The individual testing took approximately sixty-two hours. The Davis-Eells testing took approximately eight hours, making a total of about seventy hours of testing.

Statistical Procedures

Means and standard deviations were computed for both tests. The following formula was used to compute the standard deviation.(19)

$$\sigma = \sqrt{\frac{\Sigma(x^2)}{N} - \bar{x}^2}$$

The symbols are interpreted as follows:

σ = the standard deviation

Σx^2 = the sum of the differences squared

N = the size of the sample

x^2 = the mean squared

To find the significance of the difference between the Stanford-Binet and Davis-Eells IQs, critcal ratios were computed. The following formula was used to compute "t". (11)

$$= \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left[\left(\Sigma X_1^2 - \frac{(\Sigma X_1)^2}{N_1}\right) + \left(\Sigma X_2^2 - \frac{(\Sigma X_2)^2}{N_2}\right)\right]\left[\frac{N_1 + N_2}{N_1 N_2}\right]}{N_1 + N_2 - 2}}$$

The symbols are interpreted as follows:

$\bar{X}_1$ = mean of first variable

$\bar{X}_2$ = mean of second variable

$-\Sigma X_1$ = sum of values of the first variable

ΣX_2 = sum of values of the second variable

ΣX_1^2 = each value of the first variable squared and summed

ΣX_2^2 = each value of the second variable squared and summed

N_1 = number of cases for the first variable

N_2 = number of cases for the second variable

Correlation coefficients were computed from the raw data. The following formula was used to find the coefficient of correlation.(17)

$$r = \frac{Sx_1x_2}{\sqrt{(Sx_1^2)\ (Sx_2^2)}}$$

The symbols are interpreted as follows:

Sx_1 = sum of values of first variable

Sx_2 = sum of values of second variable

Sx_1^2 = each value of the first variable squared and summed

Sx_2^2 = each value of the second variable squared and summed

CHAPTER III

FINDINGS

The differences between means for the two tests for the total group and for each of the three socio-economic classifications were found not to be significant at the 5% level of confidence. Tables and discussions of each socio-economic group are presented in the following pages.

Table I

Range and Frequency in IQ of Sixty-two Selected Fifth Grade Pupils in Omaha Public Schools as Measured on the Revised Stanford-Binet and the Davis-Eells Games

Stanford-Binet		Davis-Eells	
IQ	frequency	IQ	frequency
140-144	0	140-144	2
135-139	1	135-139	2
130-134	5	130-135	2
125-129	3	125-129	0
120-124	6	120-124	1
115-119	2	115-119	5
110-114	4	110-114	5
105-109	9	105-109	3
100-104	6	100-104	9
95-99	5	95-99	7
90-94	2	90-94	4
85-89	3	85-89	8
80-84	9	80-84	3
75-79	4	75-79	5
70-74	0	70-74	5
65-69	0	65-69	1
Range:	72-136	Range:	68-143
Mean:	102.95	Mean:	98.90
S.D.:	13.25	S.D.:	18.25

Table I presents the frequency distribution of IQs on the Stanford-Binet and on the Davis-Eells obtained for the sixty-two subjects elected for study. The mean IQ on the

Stanford-Binet was 102.95 and the mean IQ on the Davis-Eells was 98.90. To determine whether this difference of 4.05 points was too great to be an accident of sampling the significance of difference between means was computed and a "t" value of 1.25 was obtained. This is somewhat below the value of 1.979 necessary for significance at the 5% level. A summary of the computations and formulas used to obtain this and subsequent critical ratios may be found in the appendix to this report.

The major problem of this study was of course to find out whether the Davis-Eells might yield significantly different IQs from the Stanford-Binet at the lower economic levels where the Davis-Eells is specifically designed to be used. Therefore, the three economic breakdowns is taken up separately and analyzed to indicate differences where they are apparent.

Table II

Range and Frequency of IQ of Sixteen Selected Pupils in the High Socio-economic Group as Measured on the Revised Stanford-Binet and the Davis-Eells Games.

Stanford-Binet		Davis-Eells	
IQ	frequency	IQ	frequency
135-144	0	135-144	2
124-134	4	124-134	2
115-124	8	115-124	4
105-114	2	105-114	3
95-104	1	95-104	4
85-94	0	85-94	1
75-84	1	75-84	0
65-74	0	65-74	0
Range:	81-132	Range:	88-140
Mean:	117.62	Mean:	115.06
S.D.:	13.03	S.D.:	13.03

Table II presents the frequency distribution of IQs on the Stanford-Binet and on the Davis-Eells obtained for the sixteen subjects in the high socio-economic group. The range, mean, and standard deviation for the tests are also presented. The range of IQs on the Stanford-Binet was 81 to 132 and on the Davis-Eells 88 to 140. The mean IQ on the Stanford-Binet was 117.62 and on the Davis-Eells 115.06. To determine whether this difference of 2.56 was too great to be an accident of sampling, the significance of difference between means was computed and a"t" value of .51 was obtained. This is far below the value of 2.042 necessary for significance at the 5% level.

Table III

Range and Frequency in IQ of Twenty-one Selected Pupils in the Middle Socio-economic Group as Measured on the Revised Stanford-Binet and the Davis-Eells Games.

Stanford-Binet		Davis-Eells	
IQ	frequency	IQ	frequency
135-144	1	135-144	2
125-134	4	125-134	0
115-124	0	115-124	2
105-114	7	105-114	4
95-104	6	95-104	6
85-94	1	85-94	4
75-84	1	75-84	0
65-74	1	65-74	0
Range: 72-136		Range: 70-143	
Mean: 107.71		Mean: 101.33	
S.D.: 16.59		S.D.: 18.11	

Table III presents the frequency distribution of IQs on the Stanford-Binet and on the Davis-Eells obtained for the twenty-one subjects in the middle socio-economic group. The range, mean and standard deviation for the tests are also presented. The range of IQs on the Stanford-Binet was 72 to 136, and on the Davis-Eells 70 to 143. The mean IQ on the Stanford-Binet was 107.71 and the mean IQ on the Davis-Eells was 101.33. To determine whether this difference of 6.38 points was too great to be an accident of sampling, the significance of difference between means was computed and a "t" value of 1.163 was obtained. This is below the value of 2.021 necessary for significance at the 5% level.

Table IV

Range and Frequency of IQ of Twenty-five Selected Pupils in the Low Socio-economic Group as Measured on the Revised Stanford-Binet and the Davis-Eells Games.

Stanford-Binet		Davis-Eells	
IQ	frequency	IQ	frequency
135-144	0	135-144	0
125-134	0	125-134	0
115-124	0	115-124	0
105-114	5	105-114	1
95-104	3	95-104	6
85-94	4	85-94	7
75-84	11	75-84	8
65-74	2	65-74	3
Range:	70-112	Range:	70-105
Mean:	89.56	Mean:	86.52
S.D.:	11.81	S.D.:	10.96

Table IV presents the frequency distribution of IQs on the Stanford-Binet and on the Davis-Eells obtained for the twenty-five subjects in the low socio-economic group. The range, mean and standard deviation for the tests are also presented. The range on the Stanford-Binet was from 72 to 112. The range on the Davis-Eells was from 70 to 105. The mean IQ on the Stanford-Binet was 89.56 and the mean IQ on the Davis-Eells was 86.52. To determine whether this difference of 3.04 points was too great to be an accident of sampling, the significance of difference between the means was computed and a "t" value of .93 was obtained. This is much below the value of 2.010 necessary for significance at the 5% level.

The correlation coefficient between the two tests for the total group was .70, which is a moderately high correlation. Table V presents the correlation for the three socio-economic classifications as well as for the total group.

Table V

Correlations Between Scores on Davis-Eells and Stanford-Binet for Each Economic Classification and Total Group Tested.

Group	Number	r
High	16	.34
Middle	21	.51
Low	25	.72
Total	62	.70

As it was stated above, the correlation for the total group was .70. For the high socio-economic group the correlation was .34, which may be described as low. The middle socio-economic group had a correlation of .51, which is also low. The low group had a correlation of .72 which is moderately high. (12)

The .34 correlation is not significantly different from zero, since with 14 degrees of freedom a value of .497 is necessary for significance at the 5% level. The .51 correlation is significantly different from zero at the 5% level since the degrees of freedom in this case would be 19 and the value necessary for significance at the 5% level with this number of degrees of freedom is .433. The value necessary

for significance at the 1% level with 19 degrees of freedom is .549. Therefore, the .51 correlation is not significant at this level. These significance levels are those listed in Edward (12), Table D.

None of the coefficients of correlations on the Davis-Eells and other tests were as high as the correlation between Davis-Eells and Stanford-Binet. The correlation between Davis-Eells and other group tests were very low. Assuming that an individual mental test is better than a group test, then this Davis-Eells Games is doing a better job of measuring a group than other group tests. Table VI presents the correlations of Davis-Eells and other group tests. (11)

Table VI

Correlations Between Scores on Davis-Eells Test and Scores on Several Forms of the Otis Quick-Scoring Mental Ability Tests.

Form of Otis Test	Source of Data	Number of years Between Testing	Grade	Number of cases	Correlation	Davis-Eells Test Mean	S.D.	Otis Test Mean	S.D.
Alpha, Short Form	A	0	3	79	.44	36.9	6.2	59.5	10.5
" " "	B	0	3	88	.61	31.8	6.2	51.4	10.5
" " "	C	0	3	117	.55	37.0	7.1	61.9	8.6
Beta	D	0	6	210	.39	49.7	6.2	39.9	10.7
Alpha, Regular Ed.	A	1	4	141	.55	42.2	6.6	120.8	15.4
" " "	B	1	4	88	.59	37.2	6.6.	108.8	16.5
" " "	C	1	4	122	.63	40.9	8.5	123.8	17.8
Beta	E	1	4	429	.49	40.7	7.6	113.2	13.2
"	E	1	5	399	.41	46.5	6.7	129.5	14.0
"	E	1	6	157	.48	49.7	5.9	136.9	15.4
Alpha, Regular Ed.	A	2	5	70	.66	46.8	6.7	122.7	16.5
" " "	B	2	5	68	.63	40.2	7.2	108.2	16.4
" " "	C	2	5	128	.58	44.9	6.8	125.2	14.2
Alpha, Regular Ed.	A	3	6	48	.51	51.8	5.3	122.7	18.4
" " "	B	3	6	47	.53	44.2	7.2	105.1	16.6
" " "	C	3	6	114	.59	49.3	6.4	127.3	14.0

Table VI shows the coefficients of correlations between the Davis-Eells and several forms of the Otis Test. The correlations between the Davis-Eells and these group tests were generally low. With the Stanford-Binet and the Davis-Eells the correlation was found to moderately high.

Table VII

Compartive Rating of Pupils on Stanford-Binet and Davis-Eells According to Socio-economic Classification.

Group	Higher Rating on Davis-Eells	Lower Rating on Davis-Eells	Same Rating on both tests	Total
High	5	11	0	16
Middle	5	14	2	21
Low	8	16	1	25

Table VII shows the comparative ratings on the Stanford-Binet and Davis-Eells according to socio-economic classification. In the high socio-economic group, Table VII shows that five students obtained higher scores on the Davis-Eells Games than on the Stanford-Binet, and eleven students obtained lower scores on the Davis-Eells. None in this group obtained the same score for both tests. In the middle socio-economic group, five students obtained higher scores on the Davis-Eells Games than on the Stanford-Binet, fourteen students obtained lower scores on the Davis-Eells and two students obtained the same score on both tests. In the low socio-economic group, eight students obtained higher scores on the Davis-Eells Games than on the Stanford-Binet, sixteen obtained lower scores on the Davis-Eells, and one student obtained the same score for both tests.

The majority of subjects in each economic classification scored lower, in terms of IQ, on the Davis-Eells than they did on the Stanford-Binet.

Table VIII

Mean on Chronological Age, Mental Age, Basal Age, and Vocabulary Words for Each Socio-economic Group as Measured on the Stanford-Binet

Group	Chronological Age	Mental Age	Basal Age	Vocabulary Words
High	10.4	12.2	9.8	15
Middle	10.9	11.0	8.10	14
Low	10.7	9.1	6.4	11

Table VIII shows the means of the chronological age, mental age, basal age and vocabulary words for each of the three socio-economic groups obtained on the Stanford-Binet. The chronological age is the exact age in years and months. Mental age is the mental maturity of the individual expressed in years and months received on an intelligence test of the mental age type, such as the Stanford-Binet. Basal age is that point on the test where every test at a certain age level is passed. Vocabulary words are the number correct received in the administration of the Stanford-Binet. The high socio-economic group had the lowest chronological age being five months less than the middle group, and three months less than the low group. The high group also had the highest mental age of twelve years and two months. This is one year and two months higher than the middle group, and three years and two months higher than the low group. The middle group obtained a basal age of eight years and ten months and the low group six years and four months. In vocabulary words there was only a difference of one between the high and middle group, and a difference of four between the

the high and low group.

These data indicate that the low socio-economic group was indeed handicapped verbally to some extent on the Binet but that this group was able to pass enough of the non-verbal items to make up for the low mean basal age to some extent.

CHAPTER IV

SUMMARY

The problem in this study was to determine whether the Davis-Eells Test of General Intelligence or Problem Solving Ability yields scores comparable to those obtained on the Stanford-Binet, form L. It is well known that children of differing cultural backgrounds do not perform equally well on currently used mental ability tests. Previous research has shown that children of differing socio-economic status perform differently on intelligence tests, favoring the high socio-economic group. Intelligence has been defined for this study as the ability to solve new problems. Socio-economic status implies social and cultural differences among groups resulting at least in part from differences in economic status. In this study socio-economic status was determined by the occupation of the employed parent or parents. These were classified into high -- professional people; middle -- white collar workers and skilled workers; and low-- unskilled laborers. Permission was secured from the Omaha Public School officials to carry out this study. Sixty-two selected fifth grade pupils were administered the Davis-Eells and Stanford-Binet, the two tests used. The Stanford-Binet is an individual test and the Davis-Eells is a group picture test.

Each subject was administered the Stanford-Binet individually. The subjects were broken down into two testing groups for the administration of the Davis-Eells. The total time of testing was approximately seventy hours.

Means were computed for both tests. The mean IQ on the Stanford-Binet was 102.95 and on the Davis-Eells 98.90. A "t" value of 1.25 was obtained. This is below the value of 1.979 necessary for significance at the 5% level. The high socio-economic group obtained a mean IQ of 117.62 on the Stanford-Binet and 115.06 on the Davis-Eells. When the significance of difference between means of these two tests was computed, a "t" value of .51 was obtained. This is below the value of 2.042 needed for significance at the 5% level. The mean for the middle socio-economic group on the Stanford-Binet was 107.71, and on the Davis-Eells 101.33 A "t" value of 1.163 was obtained which is below the value of 2.021 necessary for significance at the 5% level. The mean IQ for the low group on the Stanford-Binet was 89.56 and on the Davis-Eells was 86.52. A "t" value of .93 was obtained which is far below the value of 2.010 necessary for significance at the 5% level. To show the degree of relationship between the Stanford-Binet and Davis-Eells, correlations were computed. The correlation for the total group was .70, a moderately high correlation. None of the coefficients of correlation on the Davis-Eells and other group tests were as high as the correlation between Davis-Eells and Stanford-Binet. For the high socio-economic group "r" was .34 which indicates a low correlation for this group, the middle group obtained an "r" of .51 which also shows a low correlation. The low group obtained an "r" of .72 which indicates a moderately high relationship for this group on the two tests. Calculations of significance of difference between means for each economic group

on the two tests yielded "t" values which were not significant at the 5% level. The correlations for the high and middle group were low, but for the total group, a correlation of .70 was obtained.

Conclusions

From the analysis of data gathered in this study the following conclusions were drawn:

1. A substantial relationship exists between scores obtained on the Davis-Eells and the Stanford-Binet ($r = .70$). This value was greater than any reported between Davis-Eells scores and group mental test scores.
2. The Davis-Eells Games was approximately as accurate as the Stanford-Binet in measuring the intelligence of the children in the three socio-economic groups used in this study. No significant differences were found in mean IQ.

Suggestions for Further Research

In the lowest socio-economic group there were twenty-five cases. The mean IQ obtained for this group on the Davis-Eells was 86. The mean IQ obtained for this same group on the Stanford-Binet was 89. Although the difference was found to be not significant, with forty-eight degrees of freedom, the Stanford-Binet mean is seen to be greater than the mean on the Davis-Eells. Since the latter test was specifically designed for use with low socio-economic group children one would perhaps expect the reverse of the above find. That is assuming that the standard deviation on the two tests is approximately the same in terms of IQ. Further study with larger samples in the different socio-economic groups would be necessary to determine whether a real difference exists between these two tests in IQ level. A more satisfactory measure of socio-economic status and cultural background should be made in further studies.

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APPENDIX

Occupation of parents and IQs obtained for the high socio-economic Group.

Child	Occupation of father	Occupation of mother	Stanford-Binet	Davis-Eells
1.	Architectural Engineer	Housewife	81	101
2.	Chemist	Housewife	122	121
3.	Physician	Housewife	123	118
4.	Chemist	Housewife	120	107
5.	Teacher	Housewife	98	134
6.	Teacher	Housewife	124	103
7.	Accountant	Housewife	107	97
8.	Landscape Architect	Housewife	131	116
9.	Resturant Owner-Hayden House	Housewife	115	101
10.	Engineer	Housewife	117	140
11.	Veterinarian	Housewife	129	134
12.	Dentist	Housewife	128	114
13.	Civil Engineer	Housewife	132	135
14.	Civil Engineer	Housewife	109	88
15.	Treasurer-Northern Nat. Gas	Housewife	122	118
16.	Head of FBI	Housewife	124	114

Occupation of parents and IQs obtained for the middle socio-economic Group.

Child	Occupation of father	Occupation of mother	Stanford-Binet	Davis-Eells
1.	Office Supervisor	Housewife	101	101
2.	Mail Carrier	Housewife	132	106
3.	Office work, writes orders	Housewife	104	111
4.	Office of Phillips Pet. Oil	Housewife	98	114
5.	Salesman	Housewife	105	92
6.	United Air Lines, Station Mgr.	Housewife	95	88
7.	Salesman	Housewife	110	73
8.	Artifical Limb Co.	Secretary	91	92
9.	Office Manager	Housewife	105	143
10.	Masonery Contractor	Housewife	132	101
11.	Grocery Buyer	Housewife	109	97
12.	Stationary Buyer	Housewife	114	135
13.	Salesman	Housewife	132	116
14.	Jeweler	Housewife	99	95
15.	Electrician	Housewife	103	103
16.	Credit Manager	Housewife	82	73
17.	Credit Manager	Housewife	128	119
18.	Assistant Division Mgr.	Housewife	100	95
19.	Carpenter	Housewife	114	93
20.	Tailor	Housewife	72	70
21.	Not known, divorced	Secretary	136	111

Occupation of parents and IQs obtained for the low socio-economic Group.

Child	Occupation of father	Occuaption of mother	Stanford-Binet	Davis-Eells
1.	Bus Driver	Housewife	103	87
2.	Laborer	Laborer	84	87
3.	Laborer	Housewife	102	85
4.	Laborer	Housewife	73	72
5.	Laborer	Housewife	79	75
6.	Iron Worker	Housewife	106	102
7.	Not known, divorced	Cab Driver	79	77
8.	Laborer	Housewife	106	99
9.	Not known, divorced	Housewife	84	89
10.	Laborer	Housewife	98	87
11.	Deceased	Tiner's	108	86
12.	Divorced	Housewife	79	80
13.	Porter	Housewife	91	101
14.	Divorced	Domestic Work	79	75
15.	Laborer	Housewife	84	95
16.	Divorced	Packer	112	103
17.	Flagman - Union Pacific	Housewife	89	94
18.	Iron Worker	Waitress	82	68
19.	Divorced	Domestic Work	80	70
20.	Mechanic	Housewife	82	80
21.	Plumber	Housewife	89	97
22.	Laborer	Housewife	86	80
23.	Mechanic	Housewife	105	105
24.	Furniture Finisher	Stock Girl	89	94
25.	Hospitalized	Housewife	70	75

Computation of "t" for total group of sixty-two pupils.

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left[\frac{\left(\Sigma X_1^2 - \frac{(\Sigma X_1)^2}{N_1}\right) + \left(\Sigma X_2^2 - \frac{(\Sigma X_2)^2}{N_2}\right)}{N_1 + N_2 - 2}\right]\left[\frac{N_1 + N_2}{N_1 N_2}\right]}}$$

Stanford-Binet	Davis-Eells
$\Sigma X_1 = 6{,}383$	$\Sigma X_2 = 6{,}132$
$\Sigma X_1^2 = 677{,}459$	$\Sigma X_2^2 = 627{,}908$
$N_1 = 62$	$N_2 = 62$
$\bar{X}_1 = 102.95$	$\bar{X}_2 = 98.90$

$$t = \frac{102.95 - 98.90}{\sqrt{\left[\frac{\left(677{,}459 - \frac{6{,}383^2}{62}\right) + \left(62798 - \frac{6132^2}{62}\right)}{62 + 62 - 2}\right]\left[\frac{62 + 62}{62.62}\right]}}$$

$$t = \frac{4.05}{\sqrt{\left[\frac{\left(677459 - \frac{40848689}{62}\right) + \left(627908 - \frac{37601424}{62}\right)}{122}\right]\left[\frac{124}{3844}\right]}}$$

$$t = \frac{4.05}{\sqrt{\left[\frac{(677459 - 658849.82) + (627{,}908 - 606474.58)}{122}\right]\left[.032\right]}}$$

$$t = \frac{4.05}{\sqrt{\left[\frac{(18609.18) + (21433.42)}{122}\right]\left[.032\right]}}$$

$$t = \frac{4.05}{\sqrt{328.22 \quad .032}}$$

$$t = \frac{4.05}{\sqrt{10.503}}$$

$$t = \frac{4.05}{3.24} = 1.25$$

Computation of"t" for the high socio-economic group.

Stanford-Binet		Davis-Eells	
X_1	$(X_1)^2$	X_2	$(X_2)^2$
81	6,561	101	10,201
122	14,884	121	14,641
123	15,129	118	13,924
120	14,400	107	11,449
98	9,604	134	17,956
124	15,376	103	10,609
107	11,449	97	9,409
131	17,161	116	13,456
115	13,225	101	10,201
117	13,689	140	19,600
129	16,641	134	17,956
128	16,384	114	12,996
132	17,424	135	18,225
109	11,881	88	7,744
122	14,884	118	13,924
124	15,376	114	12,996
$\Sigma X_1 = 1,882$		$\Sigma X_2 = 1,841$	
$\Sigma X_1^2 = 224,068$		$\Sigma X_2^2 = 215,287$	
$N_1 = 16$		$N_2 = 16$	
$\bar{X}_1 = 117.625$		$\bar{X}_2 = 115.0625$	

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left[\frac{\left(\Sigma X_1^2 - \frac{(\Sigma X_1)^2}{N_1}\right) + \left(\Sigma X_2^2 - \frac{(\Sigma X_2)^2}{N_2}\right)}{N_1 + N_2 - 2}\right]\left[\frac{N_1 + N_2}{N_1 N_2}\right]}}$$

$$t = \frac{117.625 - 115.0625}{\sqrt{\left[\frac{\left(224068 - \frac{(1182)^2}{16}\right) + \left(215287 - \frac{(1841)^2}{16}\right)}{30}\right]\left[\frac{32}{256}\right]}}$$

$$t = \frac{2.563}{\sqrt{\left[\frac{\left(224068 - \frac{3541924}{16}\right) + \left(215287 - \frac{3389281}{16}\right)}{30}\right]\left[.125\right]}}$$

$$t = \frac{2.563}{\sqrt{\left[\frac{(2697.75) + (3456.94)}{30}\right]\left[.125\right]}}$$

$$t = \frac{2.563}{\sqrt{\left[\frac{6154.69}{30}\right]\left[.125\right]}}$$

$$t = \frac{2.563}{\sqrt{205.156 \times .125}}$$

$$t = \frac{2.563}{\sqrt{25.644}} = \frac{2.563}{5.064}$$

$$t = .506 \text{ or } .51$$

Computation of "t" for the middle socio-economic group.

Stanford-Binet		Davis-Eells	
X_1	$(X_1)^2$	X_2	$(X_2)^2$
101	10,201	101	10,201
132	17,424	106	11,236
104	10,816	111	12,321
98	9,604	114	12,996
105	11,025	92	8,464
95	9,025	88	7,744
110	12,100	73	5,329
91	8,281	92	8,464
105	11,025	143	20,449
132	17,424	101	10,201
109	11,881	97	9,409
114	12,996	135	18,225
132	17,424	116	13,456
103	10,609	103	10,609
99	9,801	73	5,329
82	6,724	73	5,329
128	16,384	119	14,161
100	10,000	95	9,025
114	12,996	93	8,649
72	5,184	70	4,900
136	18,496	111	12,321

$\Sigma X_1 = 2262$ $\quad\quad$ $\Sigma X_2 = 2,128$

$\Sigma X_1^2 = 249,420$ $\quad\quad$ $\Sigma X_2^2 = 222,514$

$N_1 = 21$ $\quad\quad$ $N_2 = 21$

$\bar{X}_1 = 107.714$ $\quad\quad$ $\bar{X}_2 = 101.333$

Computation of "t" for the middle socio-economic group.

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left[\frac{\left(\Sigma X_1^2 - \frac{(\Sigma X_1)^2}{N_1}\right) + \left(\Sigma X_2^2 - \frac{(\Sigma X_2)^2}{N_2}\right)}{N_1 + N_2 - 2}\right]\left[\frac{N_1 + N_2}{N_1 N_2}\right]}}$$

$$t = \frac{107.714 - 101.333}{\sqrt{\left[\frac{\left(249{,}420 - \frac{(2{,}262)^2}{21}\right) + \left(222{,}514 - \frac{(2{,}128)^2}{21}\right)}{}\right]\left[.0952\right]}}$$

$$t = \frac{6.381}{\sqrt{\left[\frac{\left(249{,}420 - \frac{5{,}116{,}644}{20}\right) + \left(222{,}514 - \frac{4{,}528{,}384}{20}\right)}{40}\right]\left[.0952\right]}}$$

$$t = \frac{6.381}{\sqrt{\left[\frac{(249{,}420 - 243{,}649.71) + (222{,}514 - 215{,}637.33)}{40}\right]\left[.0952\right]}}$$

$$t = \frac{6.381}{\sqrt{\left[\frac{(5{,}770.29) + (6{,}876.67}{40}\right]\left[.0952\right]}}$$

$$t = \frac{6.381}{\sqrt{\left[\frac{12{,}646.96}{40}\right]\left[.0952\right]}}$$

$$t = \frac{6.381}{\sqrt{316.174 \times .0952}}$$

$$t = \sqrt{\frac{6.381}{30.09976}}$$

$$t = \sqrt{\frac{6.381}{30.10}} = \frac{6.381}{5.486} = 1.163$$

Computation of "t" for the low socio-economic group.

Stanford-Binet		Davis-Eells	
X_1	$(X_1)^2$	X_2	$(X_2)^2$
103	10,609	87	7,569
84	7,056	87	7,569
102	10,404	85	7,225
73	5,329	72	5,184
79	6,241	75	5,625
106	11,236	102	10,404
79	6,241	77	5,929
106	11,236	99	9,801
84	7,056	89	7,921
98	9,604	87	7,569
108	11,664	86	7,396
79	6,241	80	6,400
91	8,281	101	10,201
79	6,241	75	5,625
84	7,056	95	9,025
112	12,544	103	10,609
82	6,724	68	4,624
80	6,400	70	4,900
82	6,724	80	6,400
89	7,921	97	9,409
89	7,921	94	8,836
70	4,900	75	5,625
105	11,025	105	11,025
86	7,396	80	6,400
89	7,921	94	8,836

$\Sigma X_1 = 2{,}239$ $\qquad$ $\Sigma X_2 = 2{,}163$

$\Sigma X_1^2 = 203{,}971$ $\qquad$ $\Sigma X_2^2 = 190{,}107$

$N_1 = 25$ $\qquad$ $N_2 = 25$

$\bar{X}_1 = 89.560$ $\qquad$ $\bar{X}_2 = 86.520$

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left[\left(\Sigma X_1^2 - \frac{(\Sigma X_1)^2}{N_1}\right) + \left(\Sigma X_2^2 - \frac{(\Sigma X_2)^2}{N_2}\right)\right]\left[\frac{N_1 + N_2}{N_1 N_2}\right]}{N_1 + N_2 - 2}}}$$

$$t = \frac{89.560 - 86.520}{\sqrt{\left[\left(203{,}971 - \frac{(2{,}239)^2}{25}\right) + \left(190{,}107 - \frac{(2163)^2}{25}\right)\right]\left[\frac{50}{625}\right]}}$$

$$t = \frac{3.04}{\sqrt{\left[\frac{\left(203971 - \frac{5013{,}121}{25}\right) + \left(190{,}107 - \frac{4{,}678{,}569}{25}\right)}{48}\right]\left[.08\right]}}$$

$$t = \frac{3.04}{\sqrt{\left[\frac{(203{,}971 - 200{,}524.84) + (190{,}107 - 187{,}142.76}{48}\right]\left[.08\right]}}$$

$$t = \frac{3.04}{\sqrt{\left[\frac{3{,}466.16 + 2{,}964.24}{48}\right]\left[.08\right]}}$$

$$t = \frac{3.04}{\sqrt{\frac{6,410.40}{48} \quad .08}}$$

$$t = \frac{3.04}{\sqrt{133.55 \text{ X } .08}}$$

$$t = \frac{3.04}{\sqrt{10.68}} = \frac{3.04}{3.27} = .9296 \text{ or } .93$$

Correlation Coefficient Between Stanford-Binet and Davis-Eells for Sixty-two Selected Fifth Grade Pupils

Child	X_1	x_1		x_1^2		X_2	x_2		x_2^2		x_1x_2	
1.	103		05		00	87	-11	90	141	61		60
2.	84	-18	95	359	10	87	-11	90	141	61	+255	51
3.	102		95		90	85	-13	90	193	21	+ 13	21
4.	73	-29	95	879	00	72	-26	90	723	61	+805	66
5.	79	-23	95	573	60	75	-23	90	571		+572	41
6.	106	+3	05	9	30	102	+3	10	9	61	+ 9	46
7.	79	-23	95	573	60	77	-21	90	479	61	+524	51
8.	106	3	05	9	30	99		10		01		31
9.	84	-18	95	359	10	89	-9	90	98	01	+187	61
10.	98	-4	95	24	50	87	-11	90	141	61	+ 58	91
11.	108	+5	05	25	50	86	-12		161	41	-65	14
12.	71	-23	95	573	60	80	-18	90	357	21	+452	66
13.	91	-11	95	142	80	101	+2	10	4	41	-25	10
14.	79	-23	95	573	60	75	-23	90	571	21	+572	41
15.	84	-18	95	359	10	95	-3	90	15	21	+ 73	91
16.	112	+9	05	81	90	103	+4	10	16	81	+ 37	11
17.	89	-13	95	194	60	94	-4	90	24	01	+ 68	36
18.	82	-20	95	438	90	68	-30	90	954	81	+647	36
19.	80	-22	95	526	70	70	-28	90	835	21	+663	26
20.	82	-20	95	438	90	80	-18	90	357	21	+395	96
21.	89	-13	95	194	60	97	-1	90	3	61	+ 26	50
22.	86	-16	95	287	30	80	-18	90	357	21	+320	36
23.	105	2	05	4	20	105	+6	10	37	21	+ 12	51
24.	70	-32	95	1085	70	75	-23	90	571	21	+787	51
25.	89	-13	95	194	60	94	-4	90	24	01	+ 68	36
26.	101	-1	95	3	80	101	+2	10	4	41	-4	10
27.	132	29	05	843	90	106	+7	10	50	41	+206	26
28.	104	+1	05	110	25	111	+12	10	146	41	+ 12	71
29.	98	-4	95	24	50	114	+15	10	228	01	-94	54
30.	105	+2	05	4	20	92	-6	90	47	61	-14	14
31.	95	-7	95	63	20	88	-10	90	118	81	+86	66
32.	110	+7	05	49	70	73	-25	90	670	81	-182	60
33.	91	-11	95	142	80	92	-6	90	47	61	+ 82	46
34.	105	+2	05	4	20	143	+44	10	1944	81	+ 90	41
35.	132	+29	05	843	90	101	+ 2	10	4	41	+ 61	01
36.	109	+6	05	36	60	97	-1	90	3	61	-11	50
37.	114	+11	05	122	10	135	+36	10	1303	21	+398	91
38.	132	+29	05	843	90	116	+17	10	292	41	+496	76
39.	99	-3	95	15	60	95	-3	90	15	21	-15	41
40.	103		05		00	103	+4	10	16	81		20
41.	82	-20	95	438	90	73	-25	90	670	81	+524	61
42.	128	+25	05	627	50	119	+20	10	404	01	+503	51
43.	100	-2	95	8	70	95	-3	90	15	21	+ 11	51
44.	114	+11	05	122	10	93	-5	90	34	81	-65	20
45.	72	-30	95	957	90	70	-28	90	835	21	+894	46
46.	136	+33	05	1092	30	111	+12	10	146	41	+399	91
47.	81	-21	95	481	80	101	+ 2	10	4	41	-46	10
48.	122	+19	05	362	90	121	+22	10	488	41	+421	01
49.	123	+20	05	402	00	118	+19	10	364	81	+382	96
50.	120	+17	05	290	70	107	+ 8	10	65	61	+138	11
51.	98	-4	95	24	50	134	+35	10	1232	01	+173	74
52.	124	+21	05	443	10	103	+ 4	10	16	81	+ 86	30
53.	107	+4	05	16	40	97	-1	90	3	61	-7	70

Child	X_1	x_1		x_1^2		X_2	x_2		X_2^2		x_1x_2	
54.	131	+ 28	05	786	80	116	+17	10	292	41	+ 479	66
55.	115	+ 12	05	145	20	101	+ 2	10	4	41	+ 25	30
56.	117	+ 14	05	197	40	140	+41	10	1689	21	+ 577	46
57.	129	+ 26	05	678	60	134	+35	10	1232	01	+ 914	36
58.	128	+ 25	05	627	50	114	+15	10	228	01	+ 378	26
59.	132	+ 29	05	843	90	135	+36	10	1303	21	+1048	71
60.	109	+ 6	05	36	60	88	10	90	118	81	-65	94
61.	122	+ 19	05	362	90	118	+19	10	364	81	+363	86
62.	124	+ 21	05	443	10	114	+15	10	228	01	+317	86
Sum	6383		10	20427	85			20	21433	42	1407	10

$\bar{X}_1 = 102.95$ $\bar{X}_2 = 93.90$

$$r = Sx_1x_2 \Big/ \sqrt{(Sx_1^2)\ (Sx_2^2)} = \frac{14,704.10}{\sqrt{(20,427.85)\ (21,433.42)}}$$

$$= \frac{14,704.10}{\sqrt{437,838,688.75}} \quad \frac{14,704.10}{20,924.60} = .702718$$

Correlation of Coefficient Between the Stanford-Binet and the Davis-Wells Games on the High Socio-economic Group.

Child	X_1	x_1		x_1^2		X_2	x_2		x_2^2		x_1x_2	
1.	81	-36	62	1341	02	101	-14	06	197	68	+514	88
2.	122	-4	38	19	18	121	+ 5	94	35	28	+ 26	02
3.	123	+ 5	38	28	94	118	+ 2	94	8	64	+ 15	82
4.	120	+ 2	38	5	66	107	+08	06	64	96	-19	18
5.	98	-19	62	384	94	134	-18	94	348	72	-371	60
6.	124	+ 6	38	40	70	103	-12	06	145	44	-76	94
7.	107	-10	62	112	78	97	-18	06	326	16	+191	80
8.	115	-2	62	6	86	101	-14	06	197	68	+ 36	84
9.	131	+13	38	179	02	116		94		88	+ 12	58
10.	117		62		38	140	+24	94	622	00	-15	46
11.	129	+11	38	129	50	134	+18	94	358	72	+215	54
12.	128	+10	38	107	74	114	-1	06	1	12	-11	00
13.	132	+14	38	206	78	135	+19	19	397	60	+286	74
14.	109	-8	62	74	30	88	-27	06	732	24	+233	26
15.	122	+ 4	38	19	18	118	+ 2	94	8	64	+ 12	88
16.	124	+ 6	38	40	70	114	-1	06	1	12	-6	76
S.	1882		08	2697	68	1841		04	3456	88	1045	42

$\bar{X}_1 = 117.62$ $\bar{Y}_2 = 115.06$

$$r = S_{x_1x_2} = \sqrt{(S_{x_1}^2)\ (S_{x_2}^2)} - \sqrt{\frac{1,045.42}{(2697.68)\ (3,456.88)}}$$

$$= \sqrt{\frac{1,045.42}{9,325.556}} = \frac{1,045.42}{3,053.744} = .343375$$

Correlation Coefficient Between Stanford-Binet and Davis-Eells Games on the Middle Socio-economic Group.

Child	X_1	x_1		x_1^2		X_2	x_2		x_2^2		x_1x_2	
1.	101	-6	71	45	02	101		33	1	09	+ 2	21
2.	132	+24	29	590	00	106	+ 4	67	21	81	+113	43
3.	104	-3	71	13	76	111	-9	67	93	51	-35	88
4.	98	-9	71	94	28	114	+12	67	160	53	-123	02
5.	105	-2	71	7	34	92	-9	33	87	05	+ 25	28
6.	95	-12	71	161	54	88	-13	33	177	69	+169	42
7.	110	+ 2	29	5	24	73	-28	33	802	59	-64	88
8.	91	-16	71	279	22	92	-9	33	87	05	+155	90
9.	105	-2	71	7	34	143	+41	67	1736	39	-112	92
10.	132	+24	29	590	00	101		33	1	09	-8	02
11.	109	+1	29	1	66	97	-4	35	18	75	-5	58
12.	114	+ 6	29	39	56	135	+33	67	1133	67	+211	78
13.	132	+24	29	590	00	116	+14	67	215	21	+356	33
14.	99	-8	71	75	86	95	-6	33	40	07	+ 55	13
15.	103	-4	71	22	18	103	+1	67	2	79	-7	86
16.	82	-25	71	661	00	73	-28	33	802	59	+728	36
17.	128	+20	29	411	68	119	+17	67	312	23	+ 358	52
18.	100	-7	7	59	44	95	-6	33	40	07	+ 48	80
19.	114	+ 6	29	39	56	93	-8	33	69	39	-52	40
20.	72	-35	71	1275	20	70	-31	33	981	57	+1118	79
21.	136	+28	29	800	32	111	+9	67	93	51	+273	56
S.	2262		09	5770	20	2128		07	6878	65	3206	95

$\overline{X}_1$ = 107.71 $\overline{X}_2$ = 101.33

$$r = Sx_1x_2 \Big/ \sqrt{(Sx_1^2)\ (Sx_2^2)} = \frac{3,206.95}{\sqrt{5,770.20)\ (6,878.65)}}$$

$$= \frac{3,20675}{\sqrt{39,691,186.23}} \qquad \frac{3,206.95}{6,300.09} = .5090 \text{ or } .51$$

Correlation Coefficient Between the Stanford-Binet and the Davis-Eells Games on the Low Socio-economic Group.

Child	X_1	x_1		x_1^2		X_2	x_2		x_2^2		x_1x_2	
1.	103	+13	44	180	67	87		48		23	+6	45
2.	84	-5	56	30	91	87		48		23	-2	45
3.	102	+12	44	154	75	85	-1	52	2	31	-18	91
4.	73	-16	56	274	23	72	-14	52	210	83	+240	45
5.	79	-10	56	111	51	75	-11	52	132	71	+121	65
6.	106	+16	44	270	27	102	15	48	239	63	+254	49
7.	79	-10	56	111	50	77	-9	52	90	63	+100	53
8.	106	+16	44	270	27	99	+12	48	155	75	+205	17
9.	84	-5	56	30	91	89	+ 2	48	6	15	-13	79
10.	98	+ 8	44	71	23	87		48		23	+ 4	05
11.	108	+18	44	340	03	86		52		27	+ 9	59
12.	79	-10	56	111	51	80	-6	52	42	51	+ 68	85
13.	91	+ 1	44	2	107	101	+14	48	209	67	+ 20	85
14.	79	-10	56	111	51	75	-11	52	132	71	121	65
15.	84	-5	56	30	91	95	+ 8	48	71	91	-47	15
16.	112	+22	44	503	55	103	+16	48	271	59	+369	81
17.	89		56		31	94	+ 7	48	55	95	-4	19
18.	82	-7	56	57	15	68	-18	52	342	99	+140	01
19.	80	-9	56	91	39	70	-16	52	272	91	+157	95
20.	82	-7	56	57	15	80	-6	52	42	51	+ 49	29
21.	89		56		31	96	+10	48	109	83	-5	87
22.	86	-3	56	12	67	80	-6	52	42	51	+23	21
23.	105	+15	44	238	39	105	+13	48	341	51	+285	33
24.	89		56		31	94	+ 7	48	55	95	-4	19
25.	70	-19	56	382	59	75	+11	52	132	71	+225	33
S.	2239		00	3446	07	2163		00	2964	23	2288	69

$\bar{X}_1 = 89.56$ $\bar{X}_2 = 86.52$

$$r = Sx_1x_2 \Big/ \sqrt{(Sx_1^2)\ (Sx_2^2)} = \frac{2{,}288.69}{\sqrt{(3446.07)\ (2964.23)}}$$

$$= \frac{2288.69}{\sqrt{10{,}214{,}944.08}} = \frac{2288.69}{3{,}196.08} = .7161 \text{ or } .72$$

Chronological age, mental age, basal age, and vocabulary words of subjects in the high socio-economic group.

	Chronological Age	Mental Age	Basal Age	Vocabulary Words
	11.2	9.0	7.0	8
	10.10	13.2	10.0	16
	10.10	13.4	12.0	18
	11.0	13.2	11.0	15
	10.9	10.6	8.0	13
	10.6	13.0	10.0	12
	11.1	11.10	8.0	11
	10.7	13.10	10.0	16
	11.0	12.8	9.0	14
	11.3	13.2	10.0	15
	10.9	13.10	12.0	23
	10.2	13.0	10.0	18
	10.4	13.8	12.0	18
	11.2	12.2	9.0	12
	10.10	13.2	10.0	21
	10.4	12.10	10.0	16
Sum	166.79	196.76	158.0	246
Mean	10.4	12.2	9,8	15

Chronological age, mental age, basal age, and vocabulary words of subjects in the middle socio-economic group.

	Chronological Age	Mental Age	Basal Age	Vocabulary Words
	11.2	11.4	8	15
	9.6	12.6	10	16
	10.7	11.0	8	10
	10.3	10.0	8	13
	10.8	11.2	8	15
	11.0	10.6	9	13
	10.6	11.6	9	12
	10.8	9.8	7	13
	11.3	11.10	10	15
	10.6	13.10	11	18
	10.8	11.8	8	12
	10.5	11.10	9	14
	11.1	14.8	12	20
	11.5	11.4	8	12
	11.2	11.6	9	14
	10.7	8.8	7	9
	11.1	14.2	10	16
	11.2	11.2	8	15
	11.3	12.10	10	14
	13.0	9.4	7	8
	10.5	14.2	12	18
S.	229.8	221.16	188.0	222
Mean	10.9	11.0	8.10	14

Chronological age, mental age, basal age, and vocabulary words of subjects in the low socio-economic group.

Chronological Age	Mental Age	Basal Age	Vocabulary Words
10.8	9.0	6	5
11.9	12.0	8	12
11.3	8.2	7	12
10.7	8.4	7	10
9.7	10.2	8	10
11.2	8.10	7	9
10.6	11.2	10	13
11.2	9.4	8	10
10.8	10.6	8	10
10.11	11.10	10	13
11.2	8.0	7	9
10.9	9.10	8	10
12.1	9.6	7	10
10.8	9.8	7	10
10.10	12.2	9	13
11.2	9.2	7	9
11.11	9.6	8	11
12.5	10.2	9	12
11.0	9.10	8	10
11.1	11.8	9	14
10.11	9.8	8	10
11.10	12.2	9	13
12.6	10.0	8	9
11.2	9.8	7	10
11.3	9.6	8	10
Sum 268.44	229.10	162.0	264
Mean 10.7	9.1	6.4	11

DAVIS-EELLS GAMES

BY **Allison Davis**
AND **Kenneth Eells**

---------- BOY ☐ GIRL ☐

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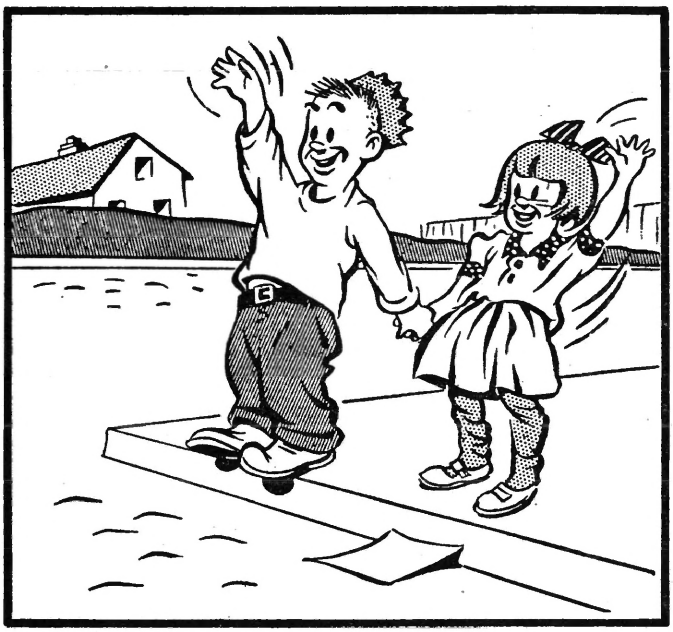

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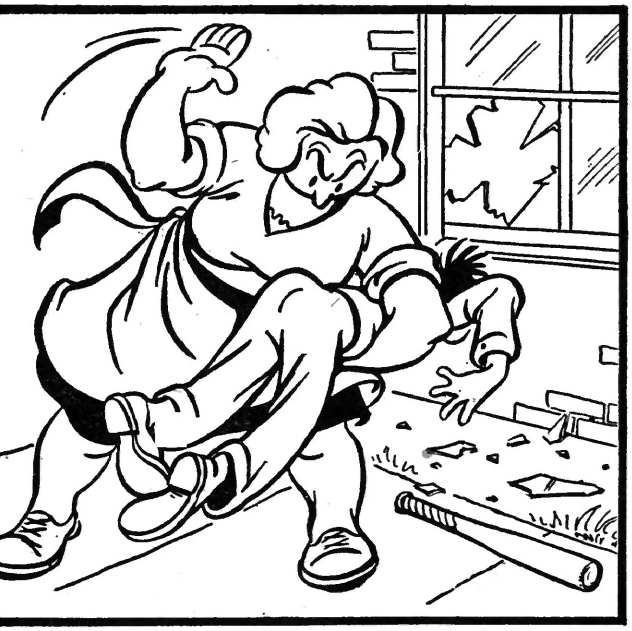

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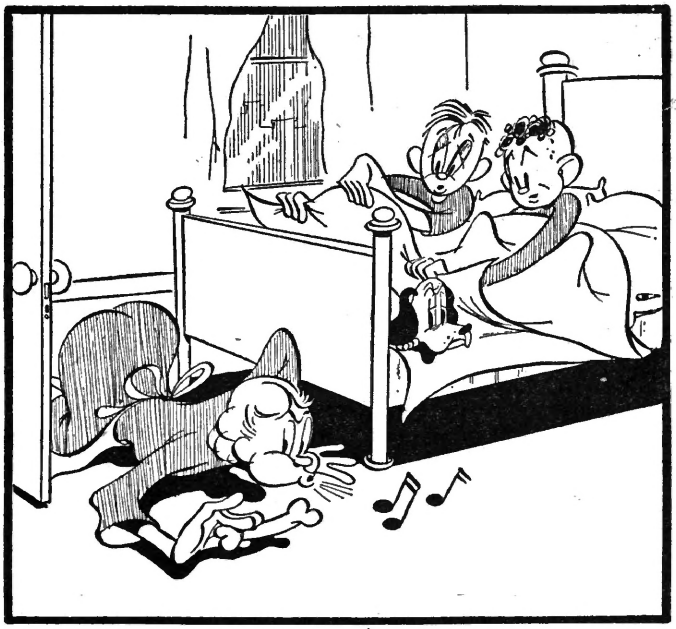

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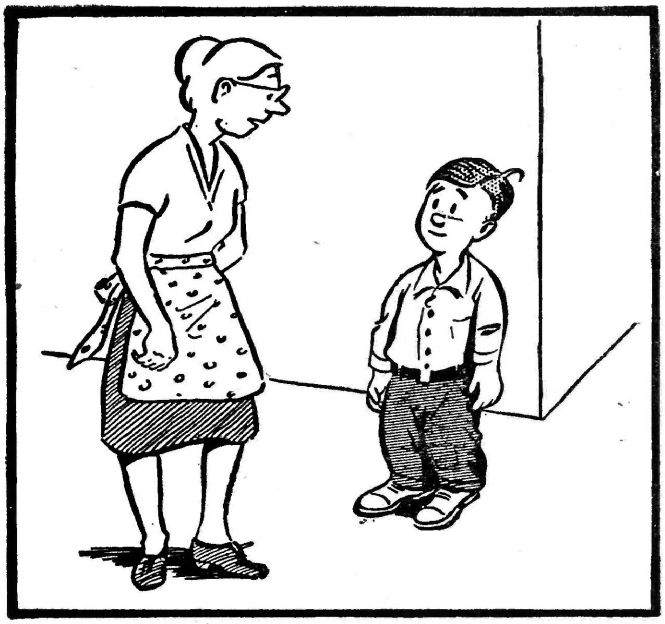

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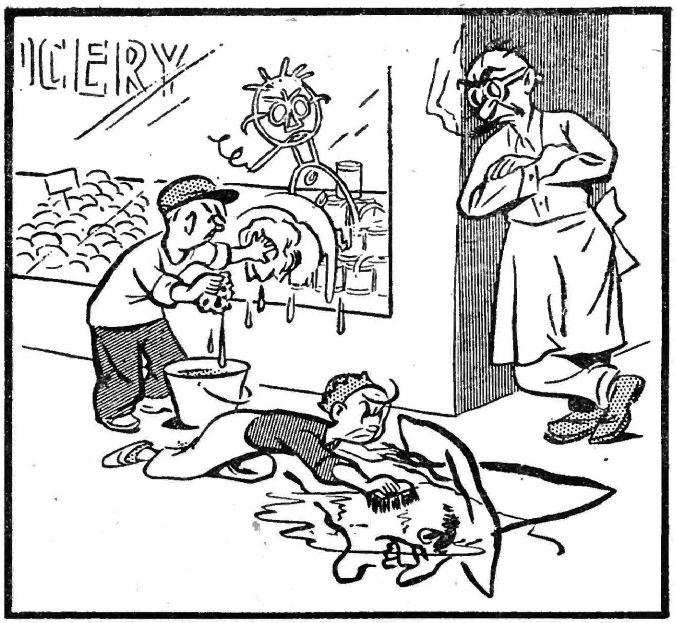

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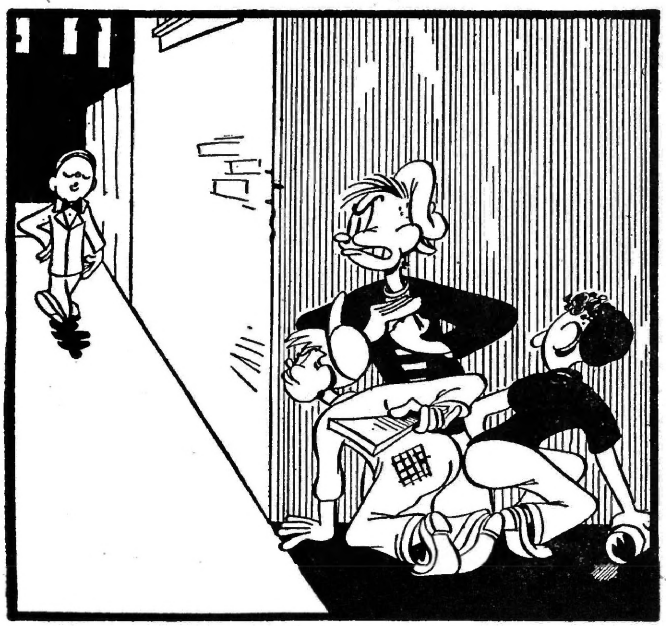

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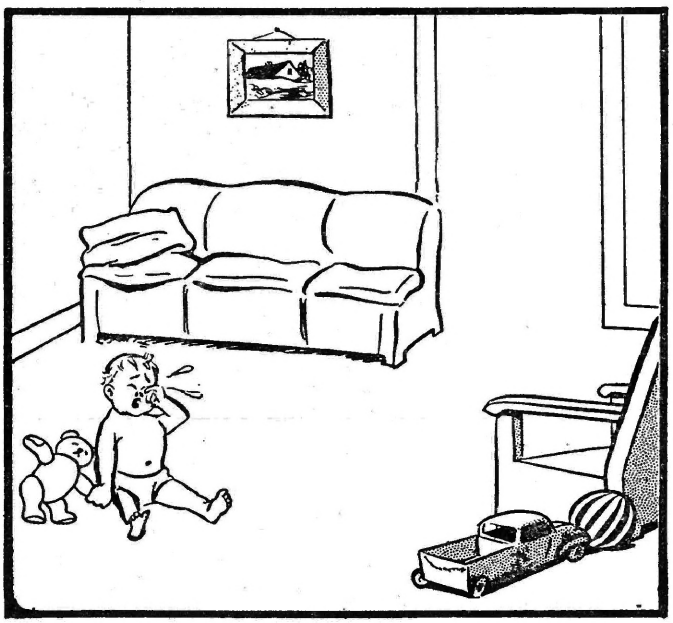

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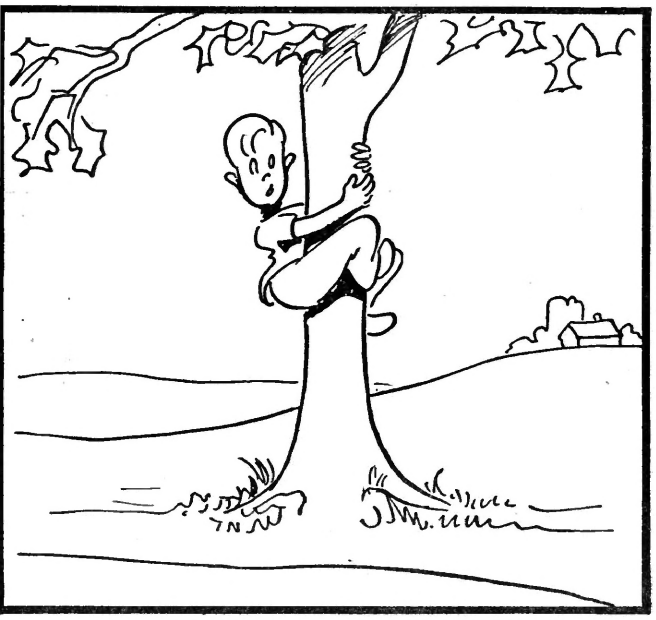

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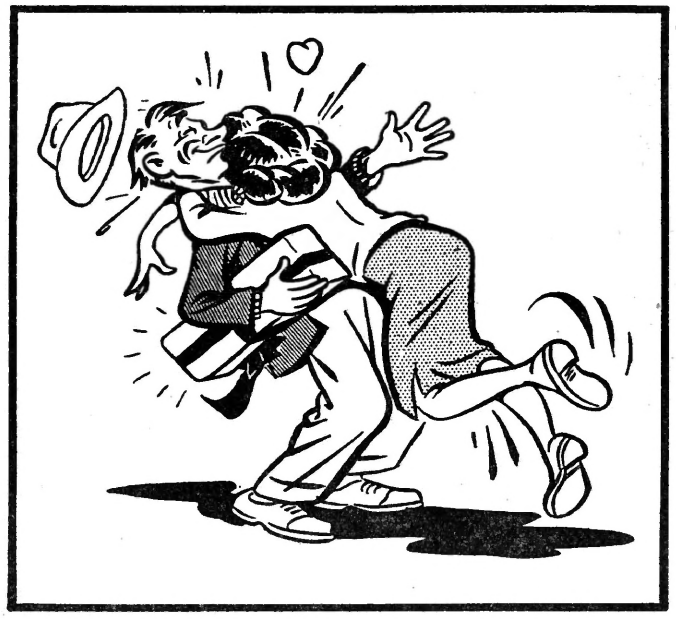

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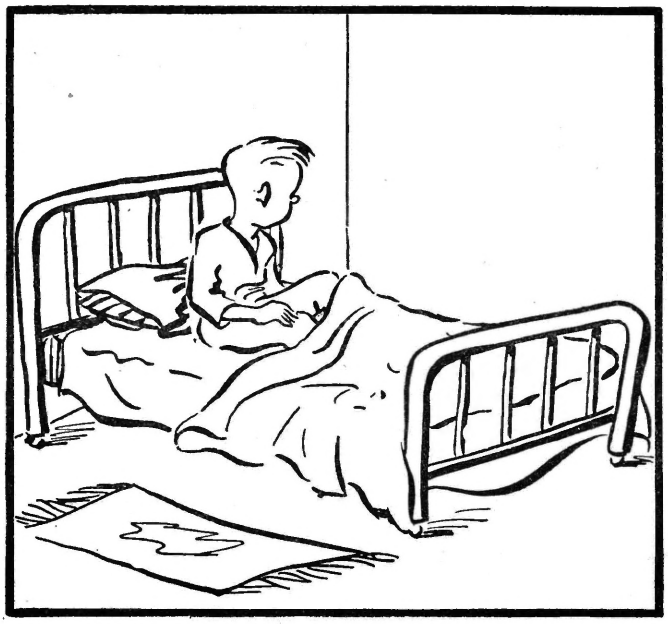

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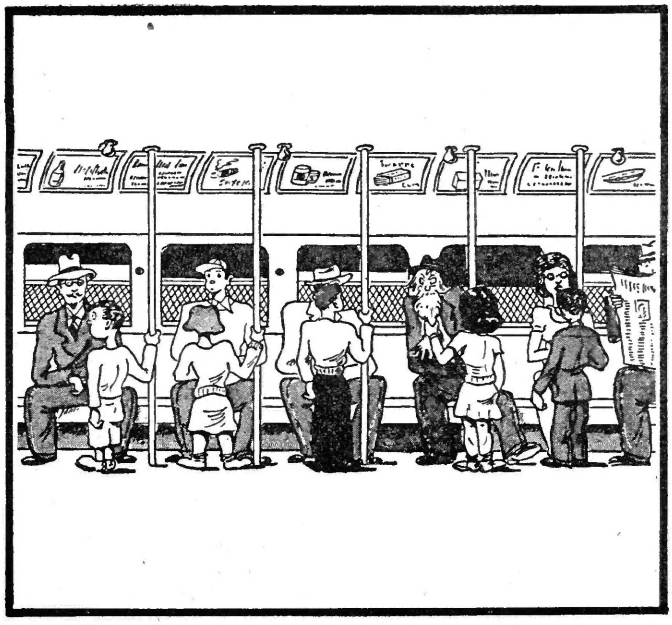

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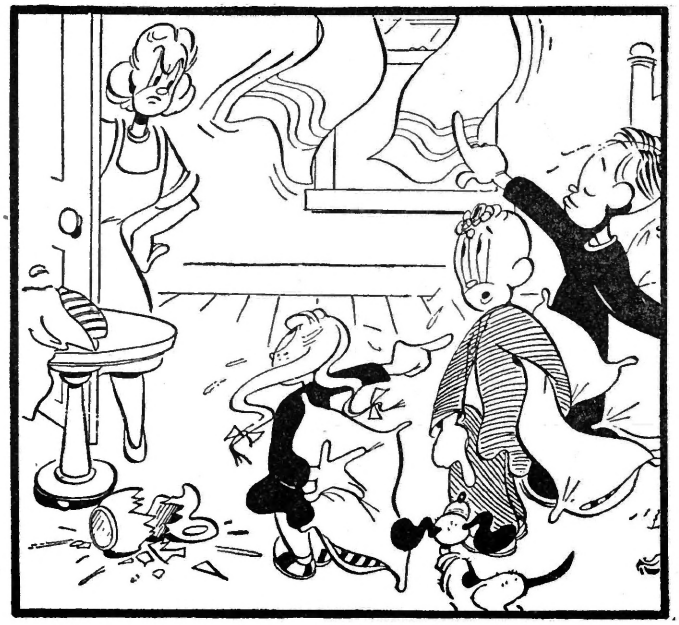

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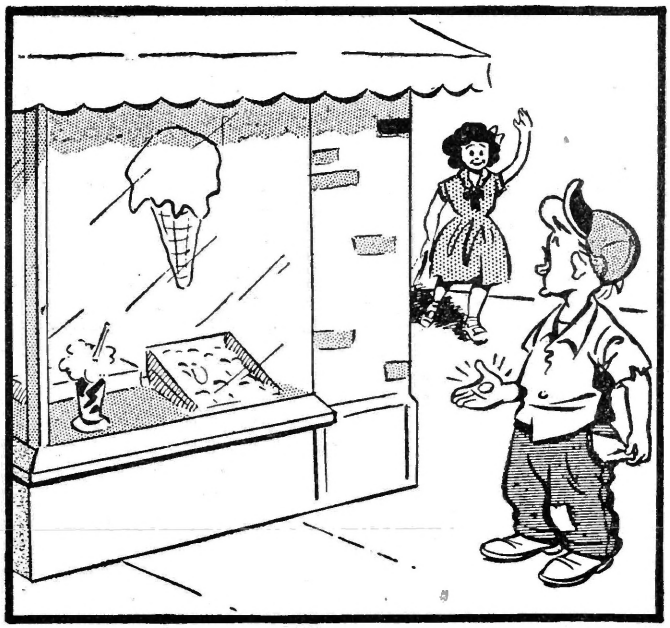

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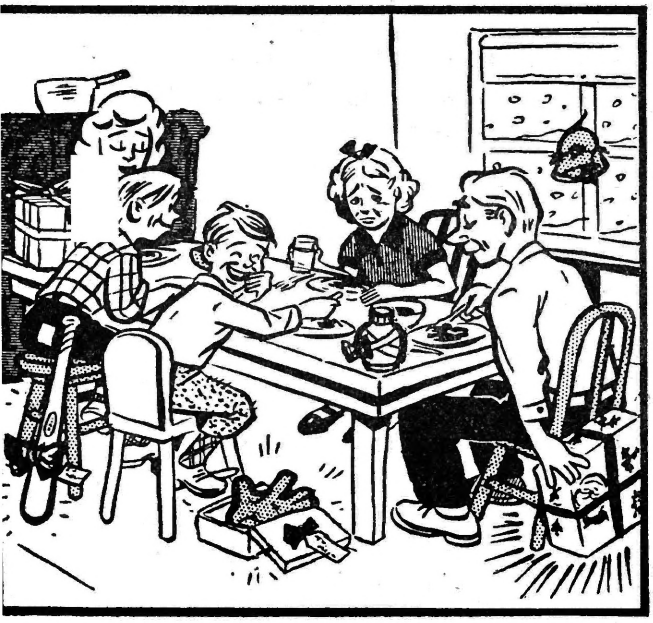

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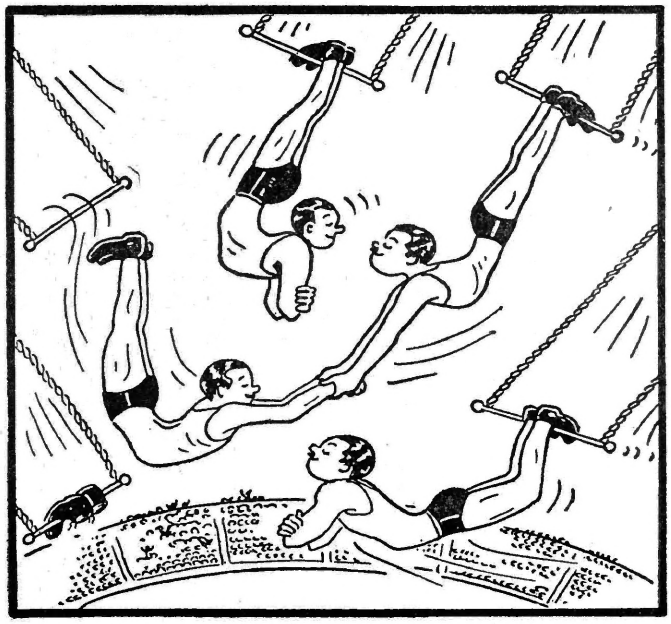

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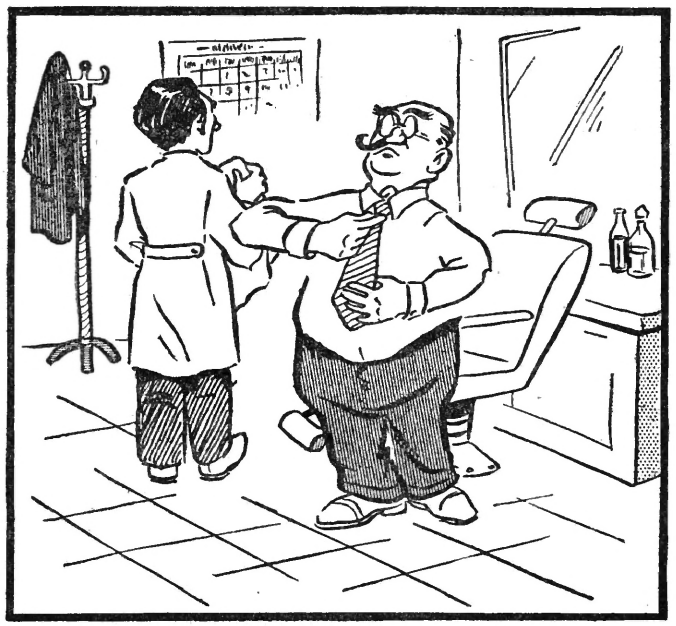

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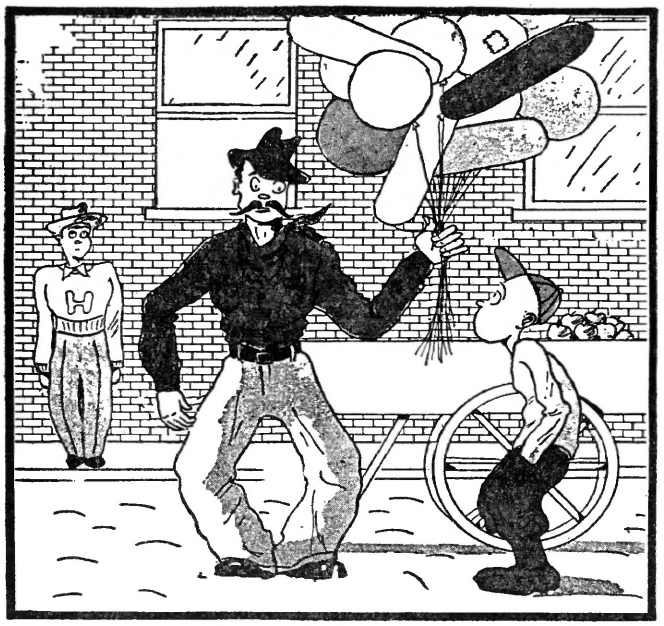

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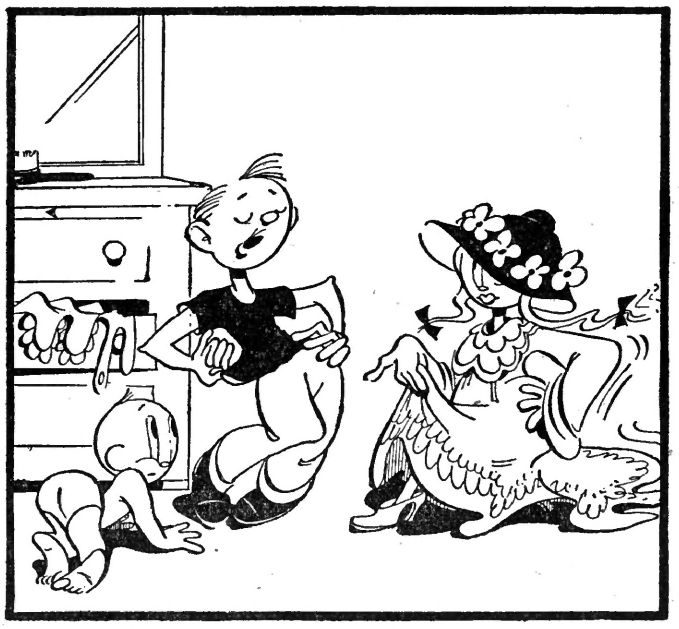

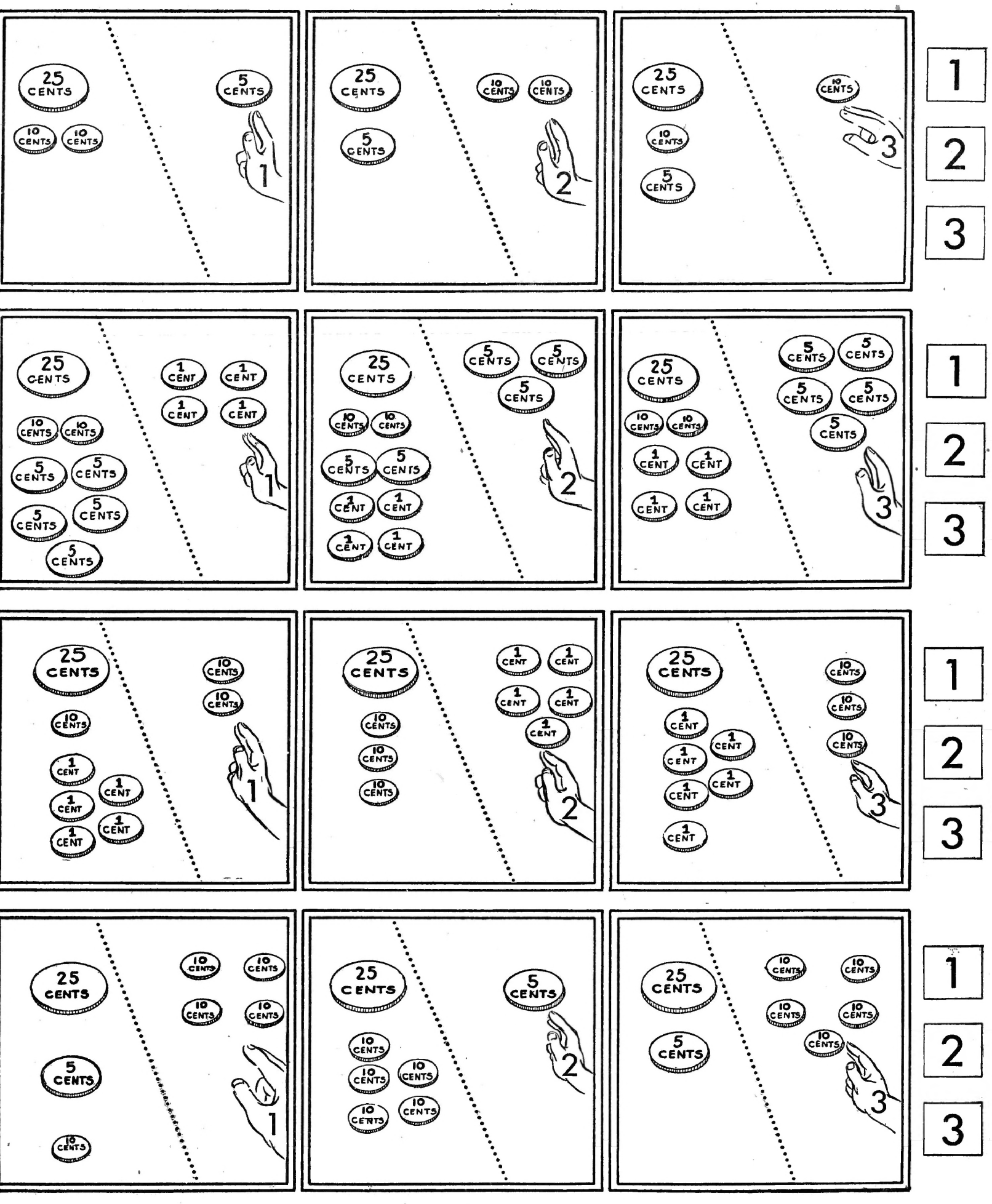
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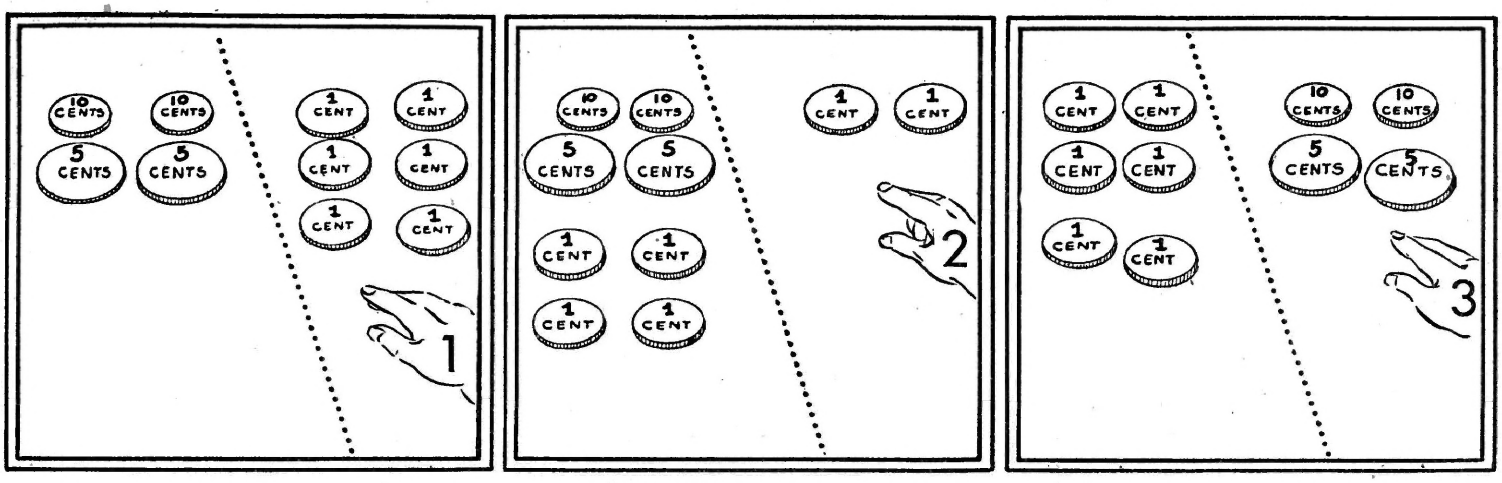
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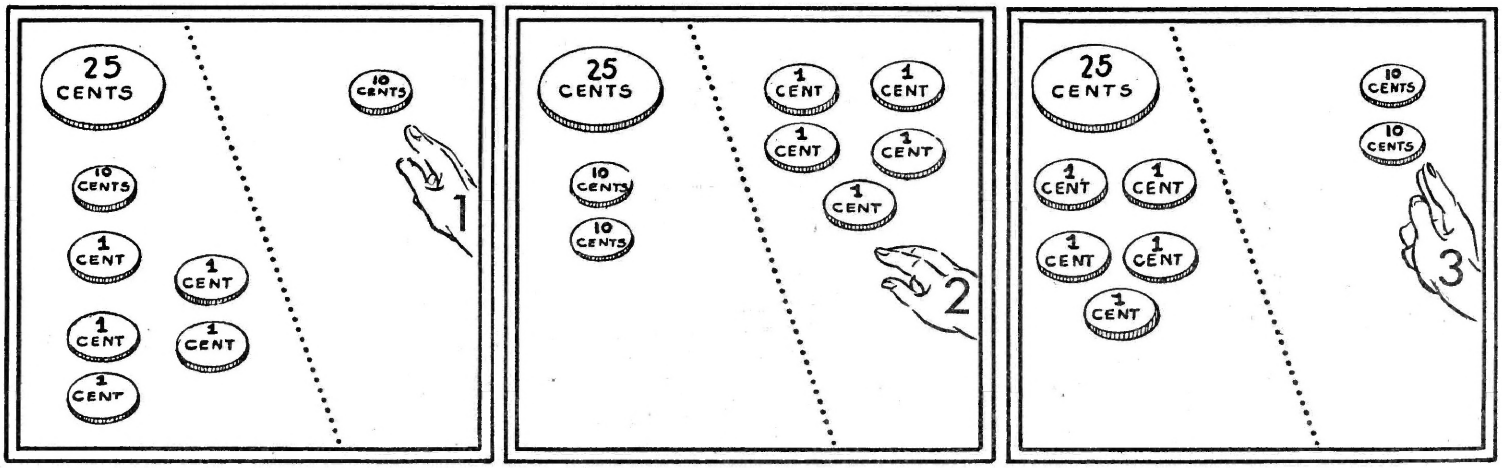
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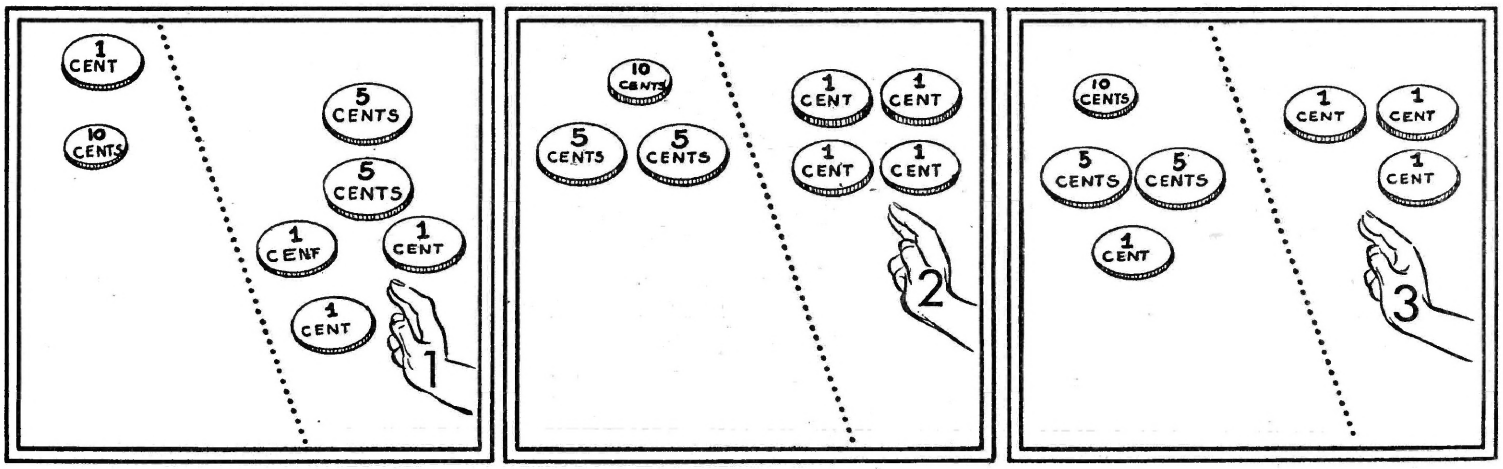
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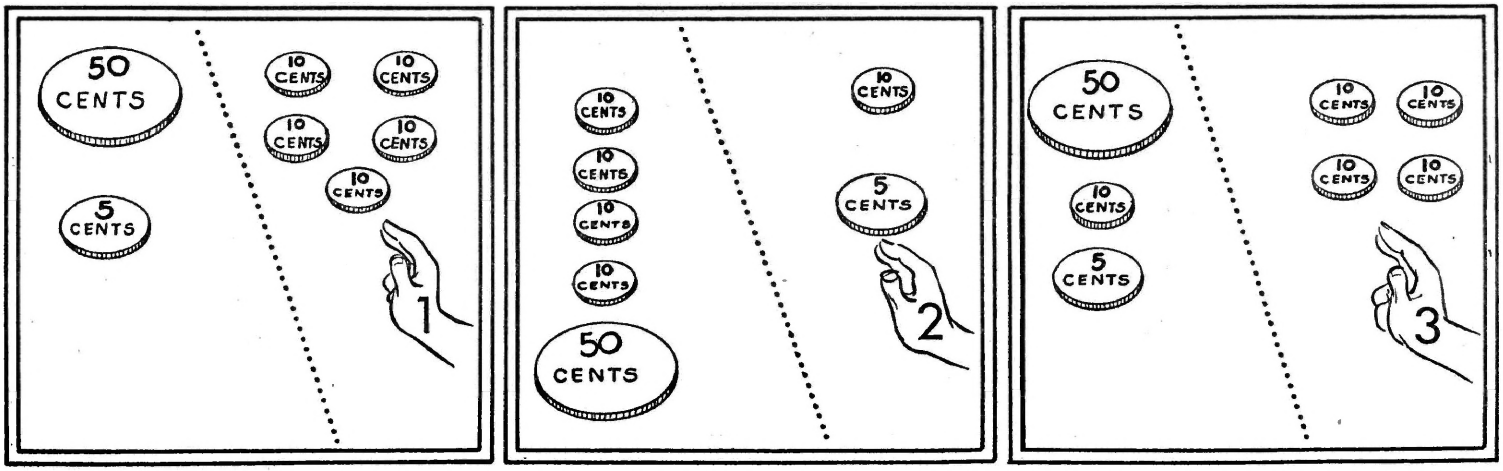
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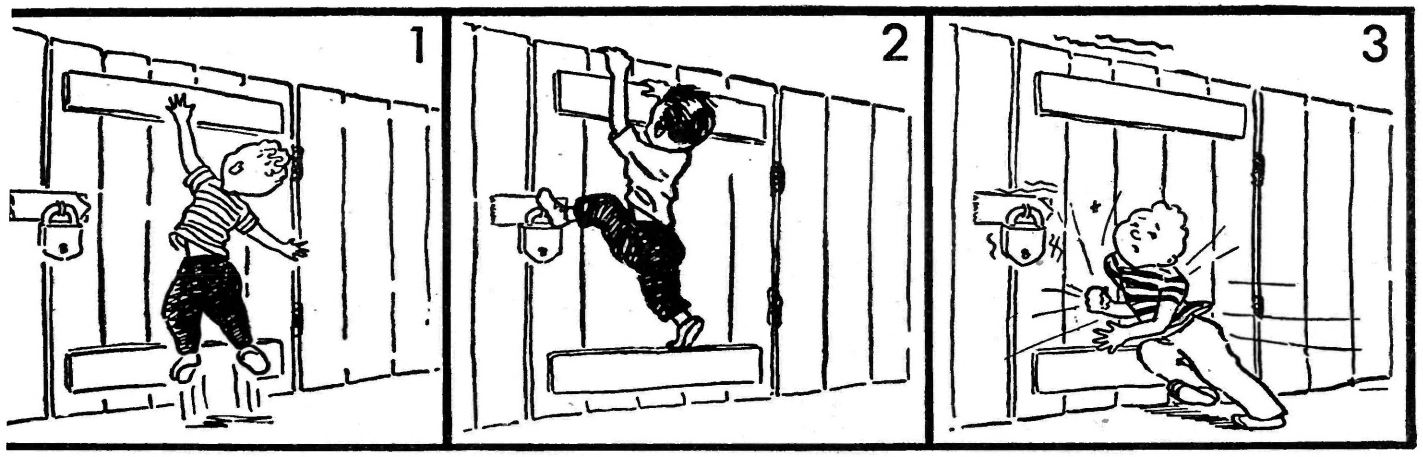

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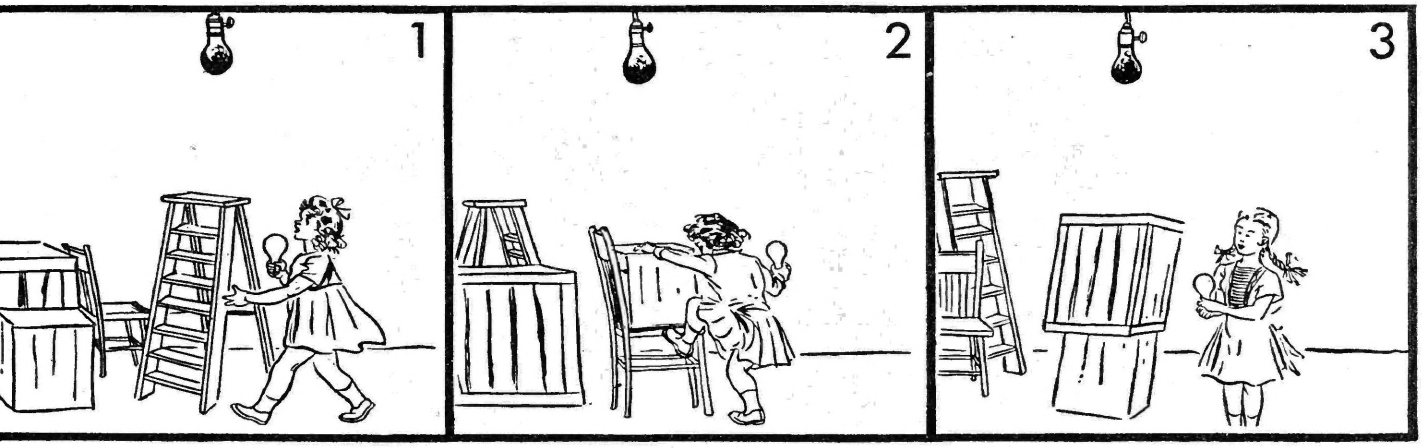

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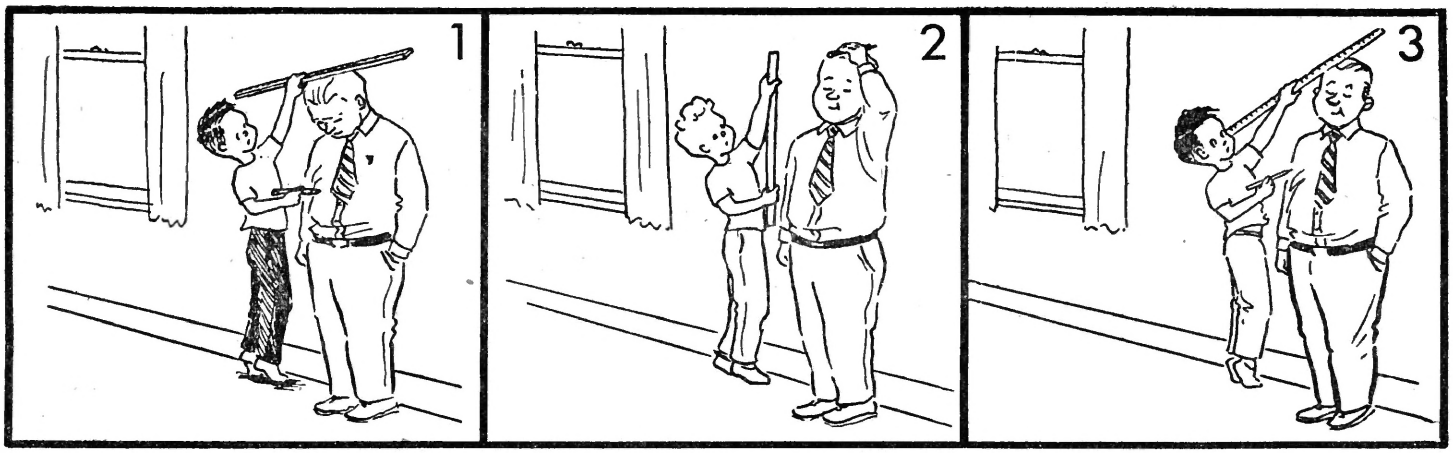

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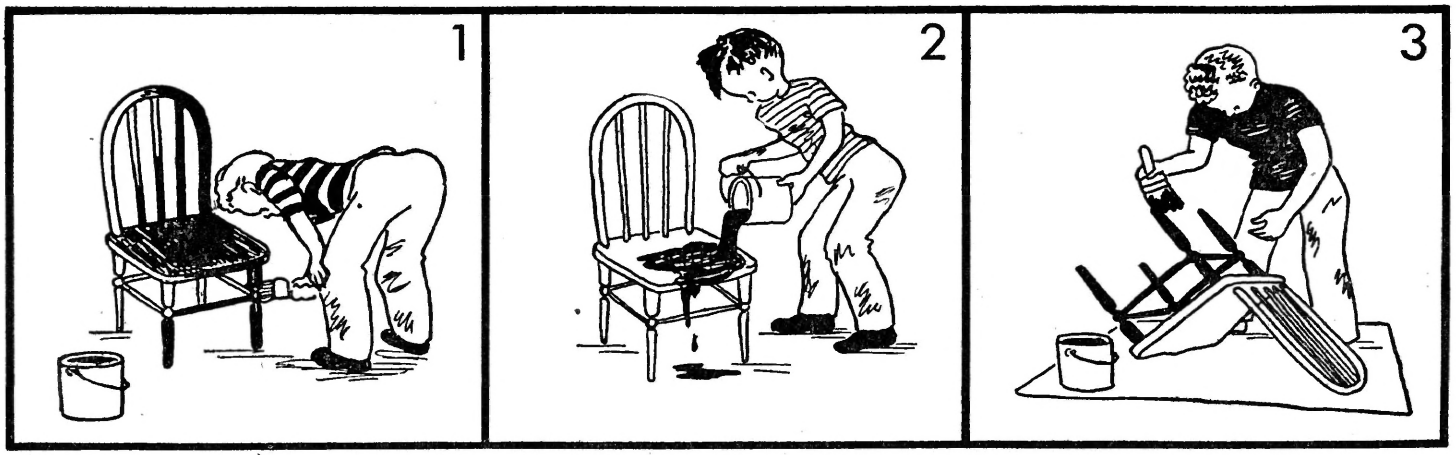

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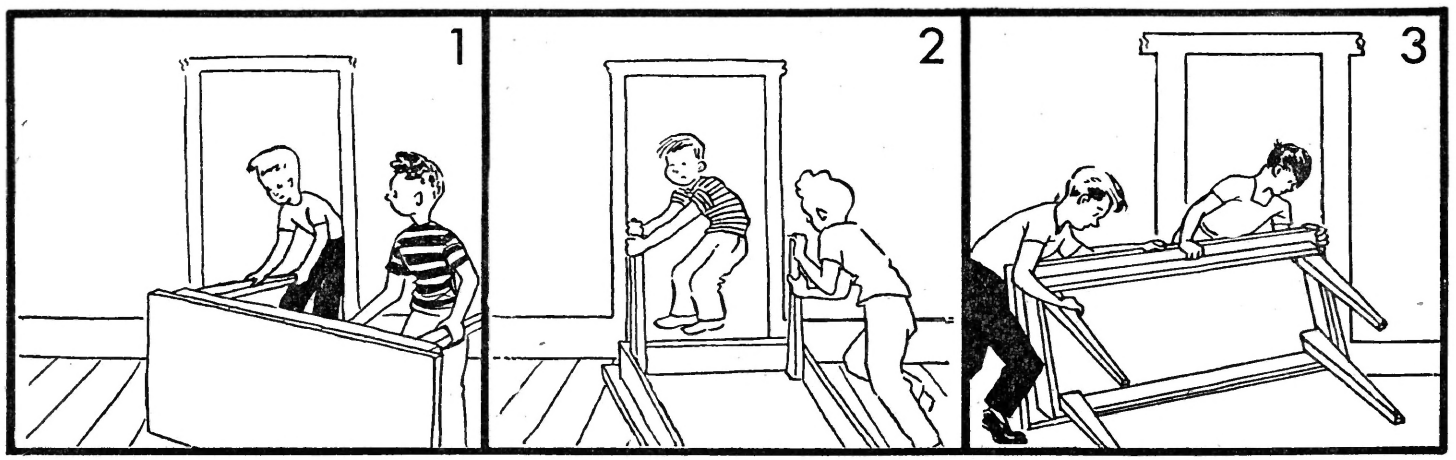

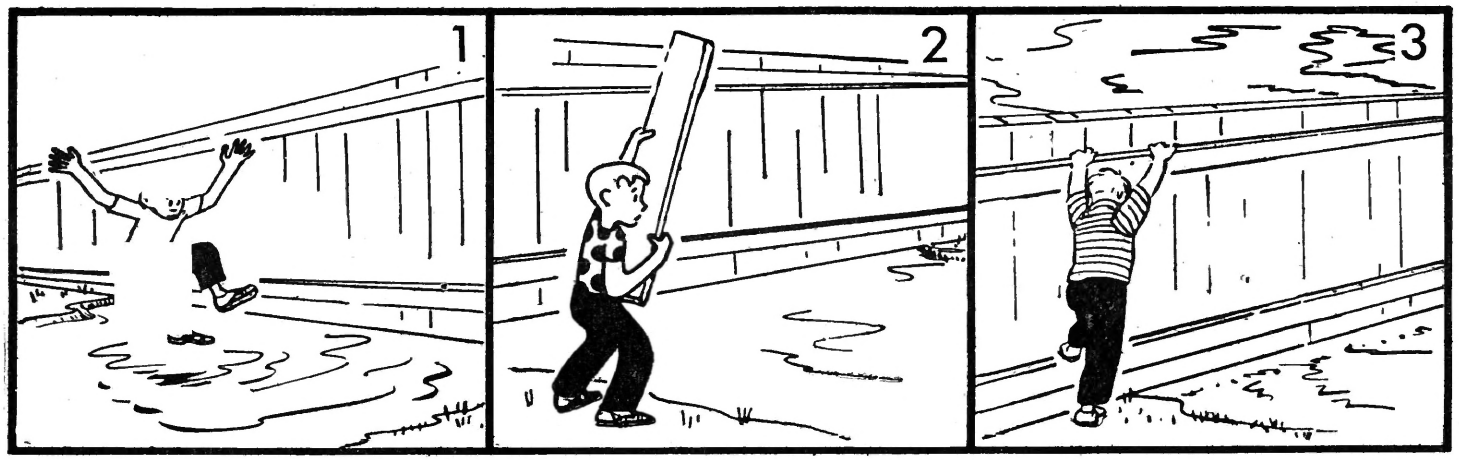

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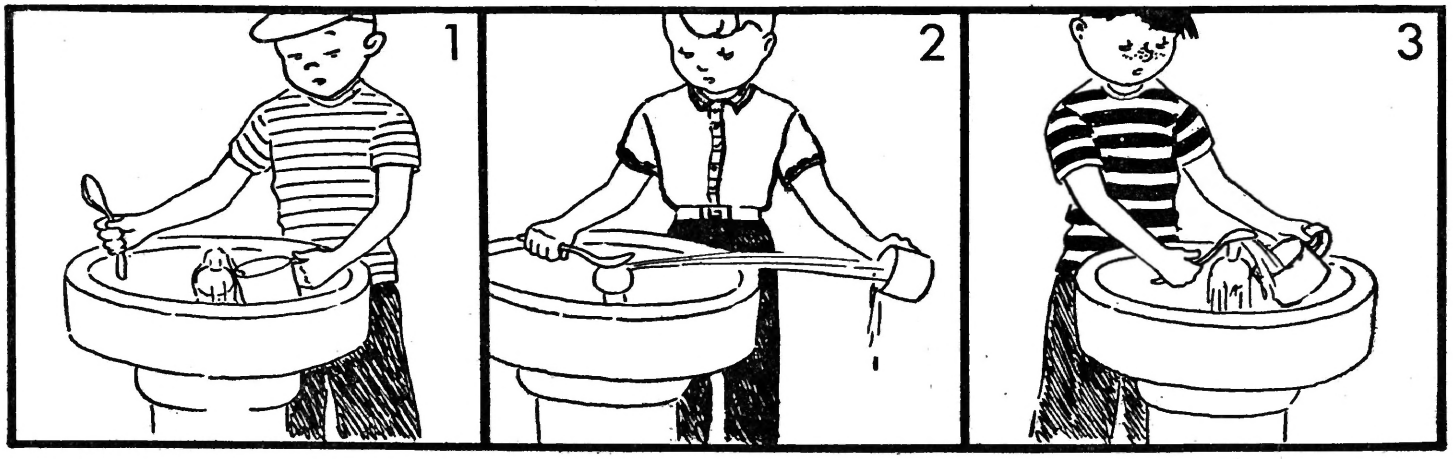

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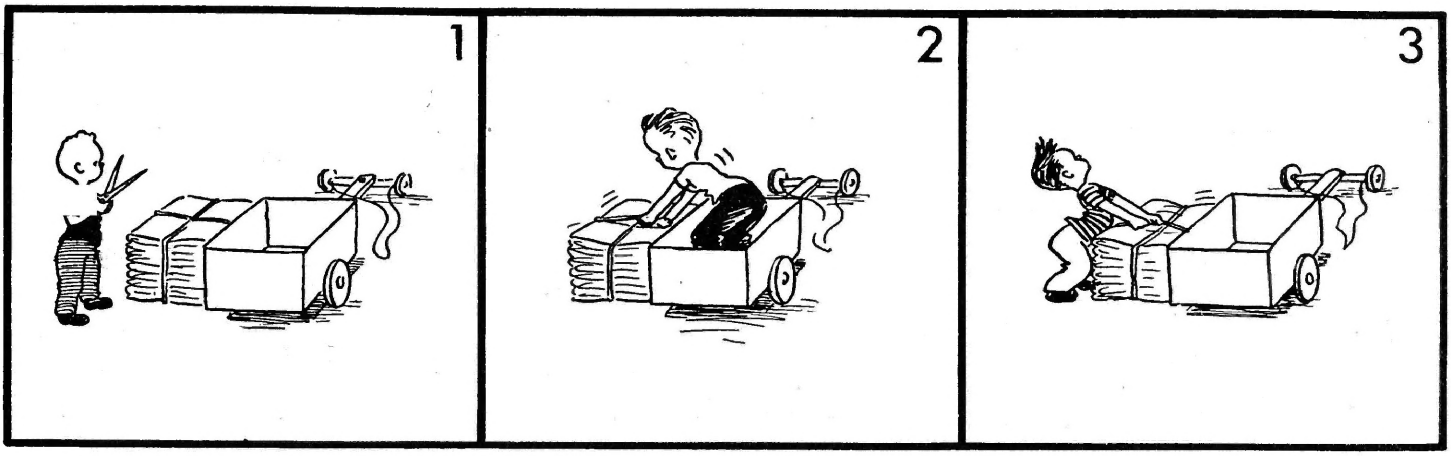

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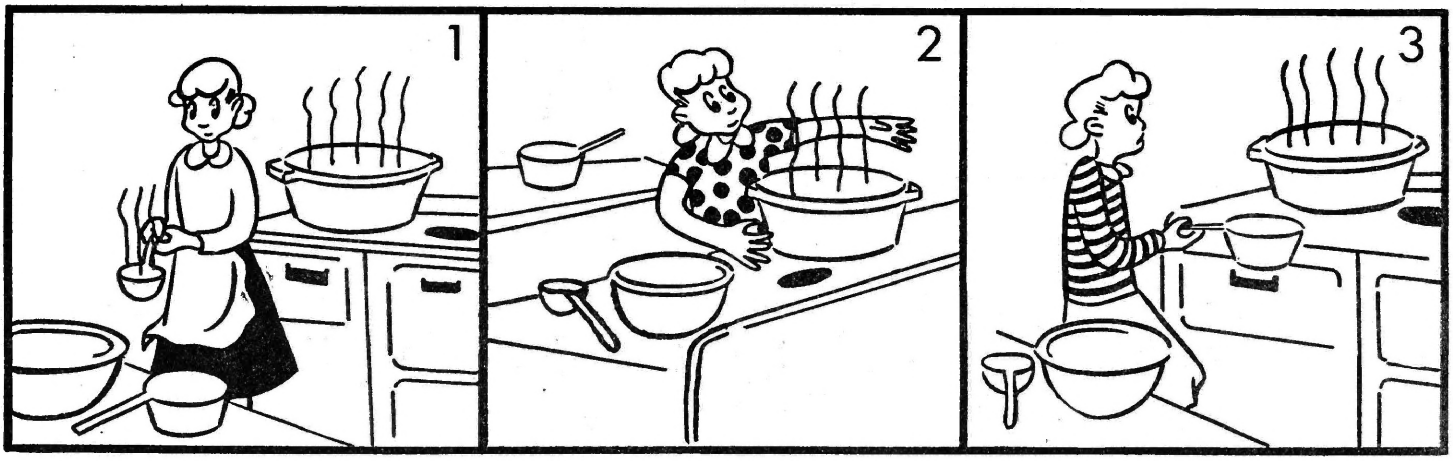

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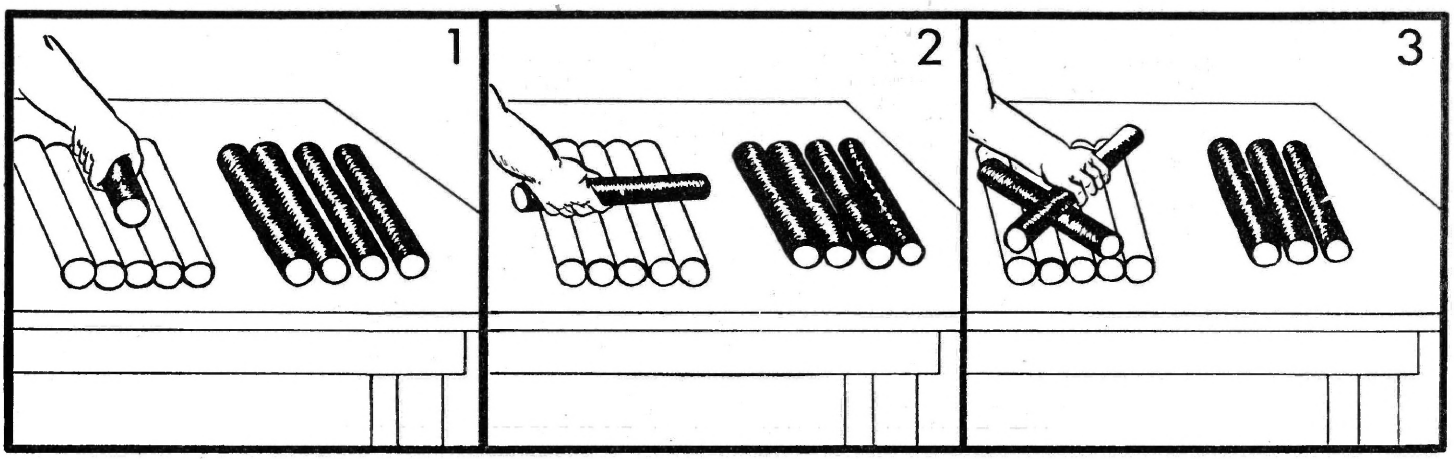

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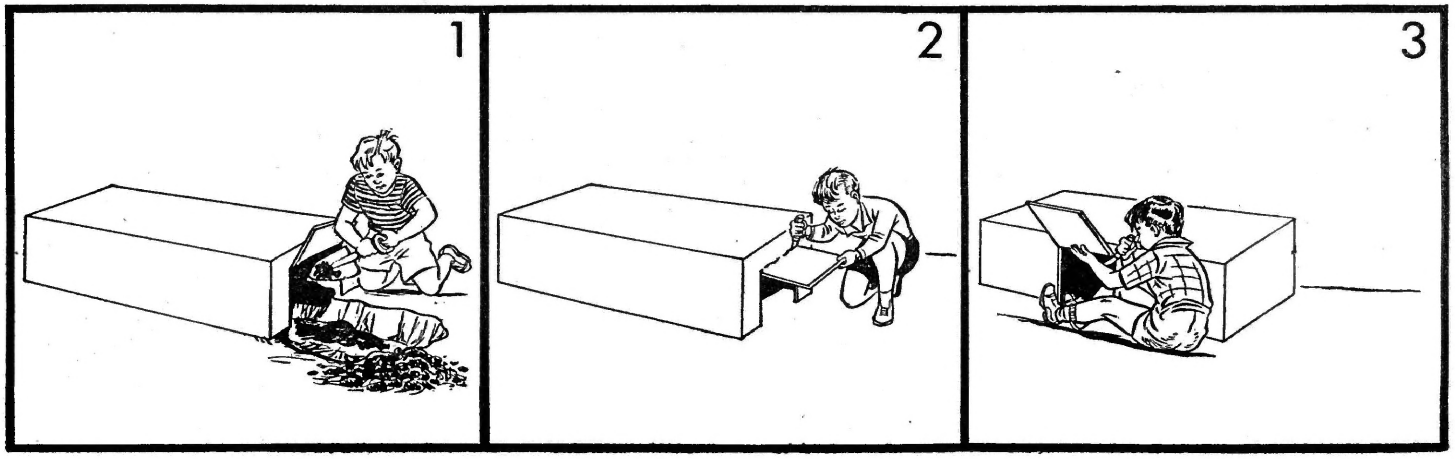

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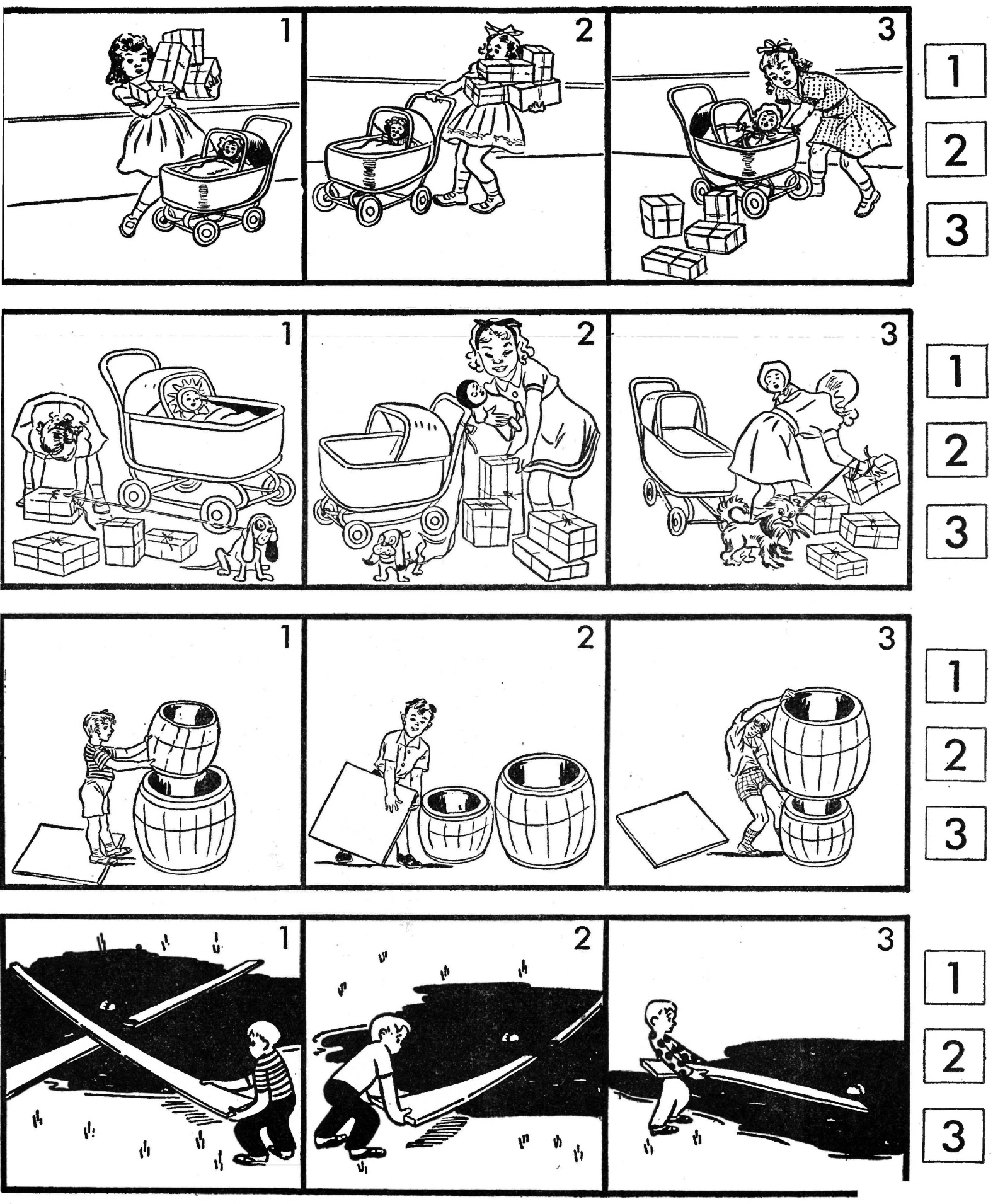
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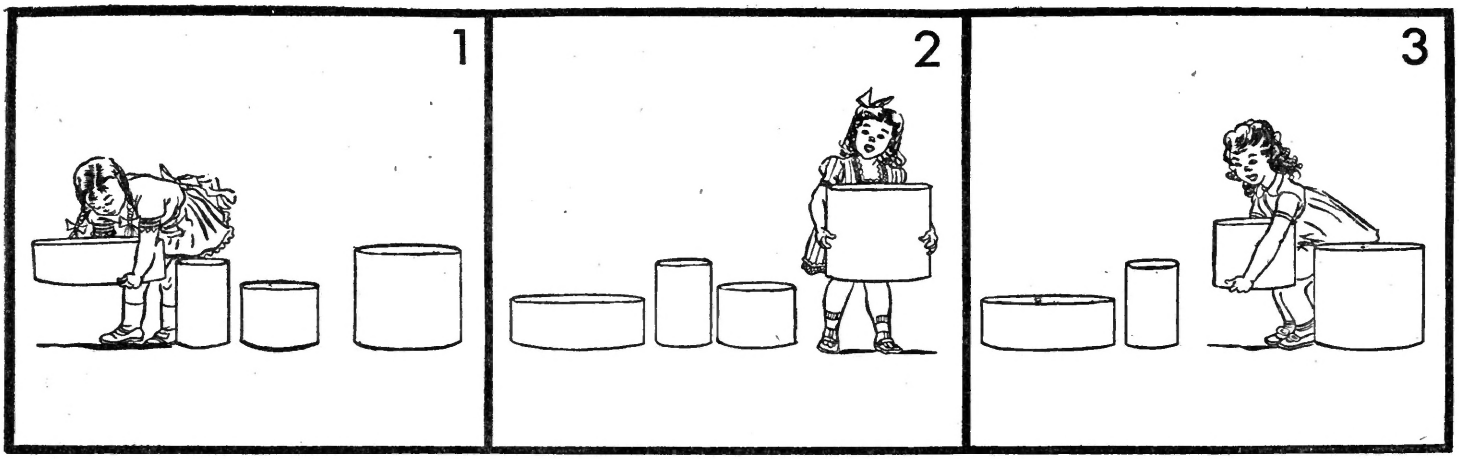

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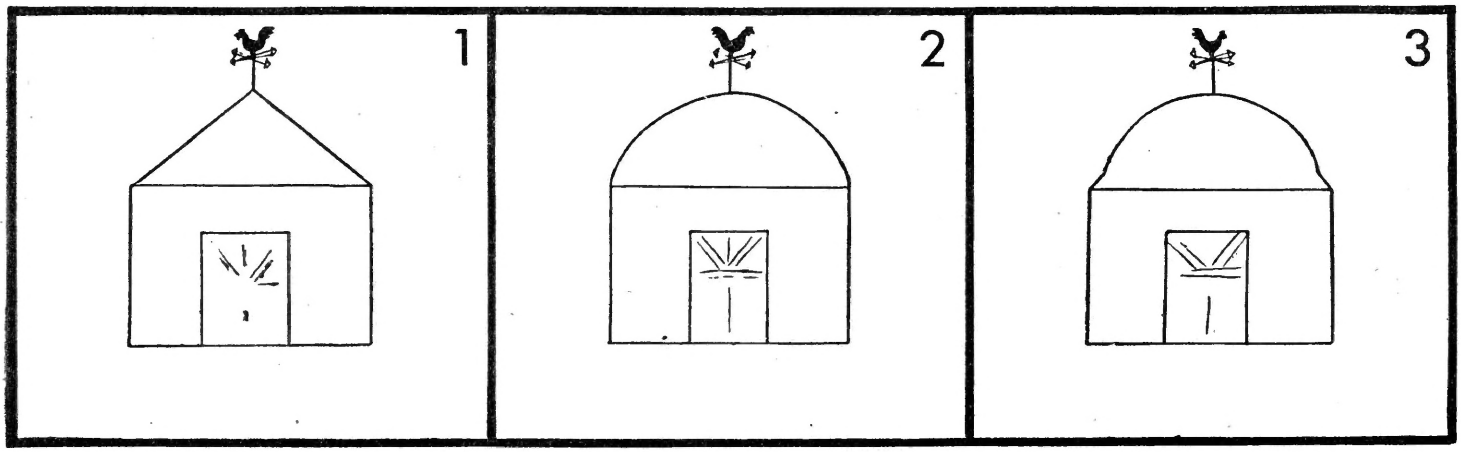

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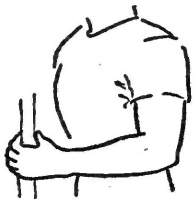

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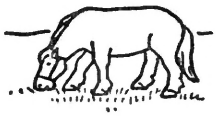

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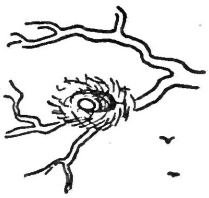

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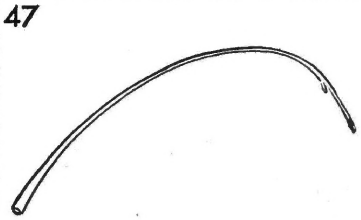

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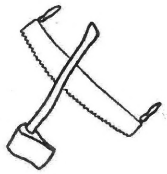

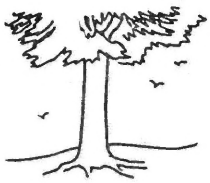

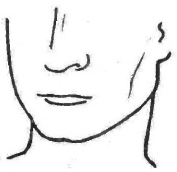

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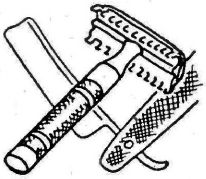

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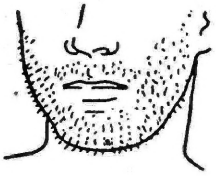

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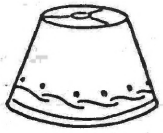

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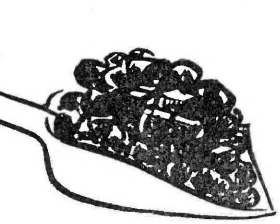

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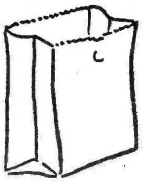

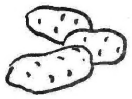

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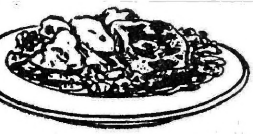

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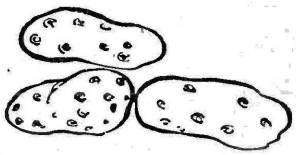

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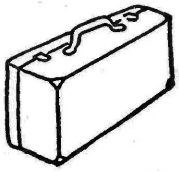

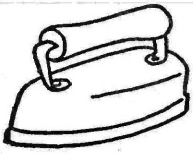

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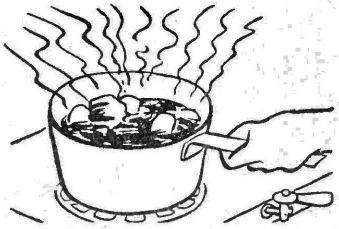

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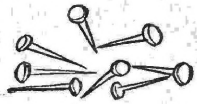

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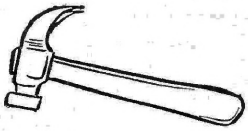

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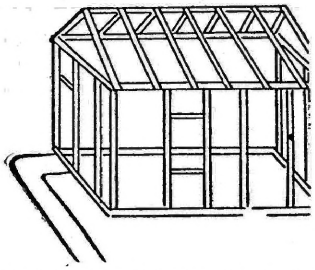

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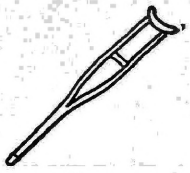

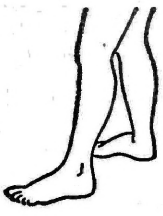

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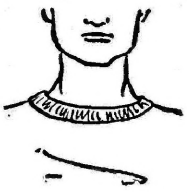

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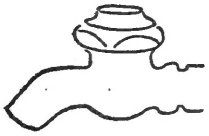

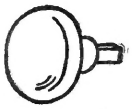

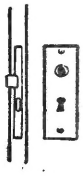

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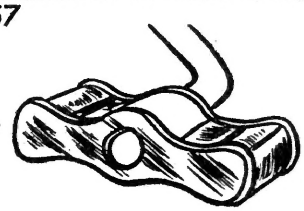

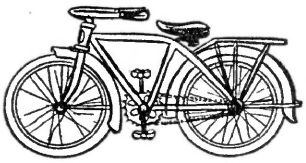

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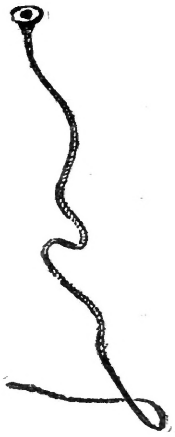

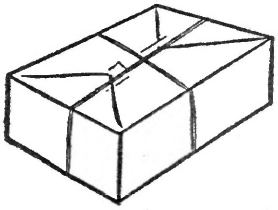

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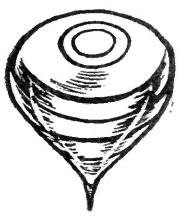

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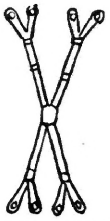

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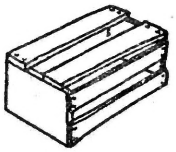

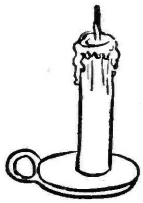

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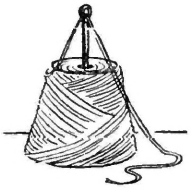

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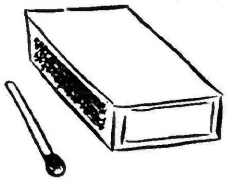

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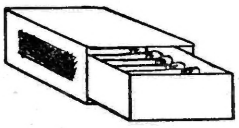

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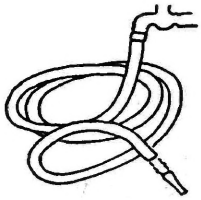

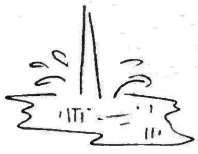

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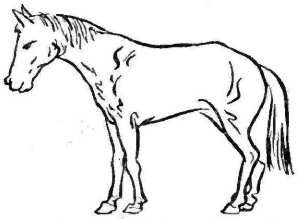

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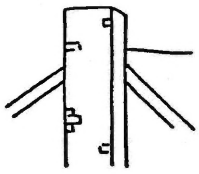

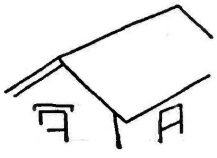

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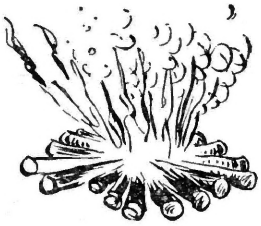

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SCHOOL_____ TODAY'S DATE_____

GRADE_____ AGE_____ _____ BIRTH DATE_____
Years Months